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PUBLISHED BI-MONTHLY

FOR THE AMERICAN PSYCHOLOGICAL ASSOCIATION

BY THE PSYCHOLOGICAL REVIEW COMPANY

PRINCE AND LEMON STS., LANCASTER, PA.

AND PRINCETON, N. J.

Registered as second-class matter July 13, 1897, at the post-office at Lancaster, Pa., under Act of Congress of March 3, 1879

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HOWARD C. WARREN, PRINCETON UNIVERSITY, and
JOHN B. WATSON, 244 MADISON AVE., NEW YORK (*Review*)
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PSYCHOLOGICAL REVIEW COMPANY

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PARIS (16, rue de Cordé)

THE PSYCHOLOGICAL REVIEW

THE PROBLEM OF LEARNING

BY LAWRENCE K. FRANK

New York City

Recently there has been a growing disposition among American students to question the adequacy of the theories of learning which, explicitly or implicitly, rely upon association and the factors of frequency, recency, trial-and-error, and so on.¹

In the theory of learning developed by Thorndike and carried on by Watson and others, the case rests upon the notion of a trial-and-error process in which the subject responds to the various stimuli of a situation until it chances upon the successful act. That is to say, it tries and makes many errors until it finally hits upon the correct way of responding to the situation and so resolves the difficulty. To explain how these discrete and random responses give rise to an errorless, coherent behavior after sufficient trials, the law of exercise, the law of effect, and so on, were developed. Along with this theory of stimulus and response behavior, there has been developed the notion of 'stamping in' of the correct behavior, with the further theory of facilitation of the synapse through repetition, to explain the mechanism or process involved in this kind of learning, whereby the pre-existing reflex arcs become selectively active and controlling in future behavior.

This theory was accepted without much criticism for many years because it looked to situation, response, and the

¹ Cf. Cason, H., 'Criticism of the Laws of Exercise and Effect,' *PSYCHOL. REV.* 1924, 3, pp. 397-417. Peterson, J., 'Intelligence Conceived as a Mechanism,' *PSYCHOL. REV.* 1924, 31, pp. 281-287. Also his earlier papers.

organism objectively. Recently it has been received with some doubts and misgivings and outspoken criticism, as in the case of Peterson's comments.²

He has called attention specifically to the difficulty of explaining how errors are eliminated, if learning is in accordance with the process described above. The *Gestalt* school also have concentrated their attack upon these weaknesses of trial-and-error theories and shown how difficult, if not impossible, it is to reconcile their experimental findings with the notions of trial and error. They dwell especially upon the difficulty of conceiving each element in the situation as discrete and as having equal potency to stimulate a response and of then explaining how a successful, integrated response to the total situation can arise. Association, frequency, recency, effect, and similar notions are fairly and adequately criticized.

As nearly as the writer can understand the matter, the *Gestalt* theory has developed the notions of 'a figure on a ground,' of 'insight,' and of a 'structure' or 'configuration,'³ to explain perception and how a subject learns to deal with a situation in a manner for which current theories of learning (behavioristic schools) are inadequate.

In learning, the *Gestalt* group point to the fact that there is a task or achievement involved in the situation, to accomplish which the subject must see the precise 'configuration' of elements necessary to its successful achievement. That is to say, it is only in so far as the significant elements or objects in a situation are perceived in a 'configuration,' or organized whole, that the subject can learn to deal with the situation successfully.

The *Gestalt* theory employs the two conceptions of 'insight' and of 'configuration' or 'structure' as the central features of its theory of learning. The 'insight' is exhibited by the learning organism when it approaches the situation or

² Peterson, J., 'A Note on Theories of Learning,' *PSYCHOL. BULL.* 1922, 19, p. 445. Cf., also, Wilson, W. R., 'Selection in Trial and Error Learning,' *PSYCHOL. REV.* 1924, 31, pp. 150-160.

³ See Koffka, K., 'Perception: An Introduction to the Gestalt-Theorie,' *PSYCHOL. BULL.* 1922, 19, pp. 531-585. Also his 'Growth of the Mind.'

task as a 'structure' or 'configuration' to be dealt with as a whole, as contrasted with the apparently aimless responses (of the behavioristic account) to discrete stimuli; and the situation, with its task or problem, is considered as presenting a 'structure' or organized whole to the organism with 'insight,' in contrast with the notion of a situation having no initial coherence or relevance to the subject.

The contrast with the trial-and-error theory of learning may be emphasized in the treatment of the time of appearance of these two features of the problem: ability to see the 'problem' and to deal successfully with the situation is considered, by the trial-and-error theory, to be something which is developed in the subject in the course of the random responses it makes to the situation, and, if they would admit the term 'insight,' the trial-and-error theorists would probably say that 'insight' was not present prior to the learned response, as the *Gestalt* theory implies, but was just this learned behavior, developed in the course of the activity. Moreover, the trial-and-error theorist would probably deny any prior discovery of a 'structure' or 'configuration' in the situation by the subject. He would admit only a complex of stimuli, some of which become 'organized' into a controlling whole, as a consequence of repeated trials and successes. If the subject fails to learn the successful behavior he never develops any 'insight' or ability to deal with the situation.

The choice between the trial-and-error theory and the *Gestalt* theory does not foreclose the possibility of other alternatives which will recognize the validity of these foreign and domestic criticisms. The purpose of this paper is to suggest one such alternative.

I

Taking the conception of configuration first, we may approach the critical question of whether a situation presents merely a confused array of stimuli or an organized structure from the viewpoint of natural science. From the human standpoint, phenomena or events occur in sequences, in which there are an antecedent event and a consequent event; or,

the world may be viewed as an aggregate of point-events, or sequences which have both a spatial and a temporal order. The discovery of the spatial order or sequence is the problem of structure, organization, or form. The discovery of the temporal order or sequence is the problem of function, activity or behavior. Since the spatial and temporal order is generated by the release of energy in discrete quanta, we have the problem of magnitude or quantity, so that science may be viewed as the attempt to discover the spatial and temporal sequences and the magnitudes (of energy) they involve.

We live in a world in which everything exists or happens as part of a sequence or space-time order; these sequences of things and events are not separate and distinct but are presented as simultaneous and coterminous; many things exist and happen in any one situation. Each situation, moreover, presents to the human observer a plurality of sequences, since each point or event not only arises in a complex of spatial and temporal sequences of points and events making up the total situation objectively, but also gives off energy which is propagated abroad as light, sound, odors, pressures and so on. That is to say, each object or occurrence is a consequent or an antecedent in a sequence of events and is also the occasion for a release of energy in such forms that they impinge on the sensorium of organisms (or may be made to do so with appropriate instruments). Thus we have sequential events and concurrently we have what is called sensation, perception and so on, in the organism. The world is both complex and ambiguous, therefore, and each situation presents a multiplicity of sequences and of stimuli. To illustrate, the impact of the firing pin on the cartridge not only initiates the sudden ignition of the powder, the expansion of gases, the propulsion of the bullet and so on, but it also gives off energy which impinges on the eyes, ear drums, etc., of the spectators and gives rise to light, sound, etc.⁴

The world appears to be a welter of confusion and ambiguity, because there is such a multiplicity of orderly sequences

⁴ Cf. the writer's 'Development of Science,' *J. Phil.*, 1924, 21, especially pages 10 and 11.

all present at one time, *i.e.*, because in any one situation there are so many points and events occurring in *their* appropriate sequence or order. The confusion and ambiguity, however, exist only for the organism which is faced with a difficulty or a problem; there is no hesitation or doubt, so to speak, among the objects and events involved in each of these numerous sequences, where each maintains or changes a spatial position in accordance with the specific spatial antecedents or else moves, functions, and behaves as its appropriate antecedent event occurs. Thus we see that for physical events with a limited range of activity, the specific antecedents to their function or behavior are presented unequivocally; but as we go up the scale of differentiation of structure (and function) the ambiguity increases.⁵ As we might state it, the increasing range of reception of stimuli (or participation in sequences) gives an organism so many more possible stimuli and consequently more of a range of activity, with greater possibilities of outcome in moving through space and time toward the functional occasions of its life.

To return to the question of configuration, must we not say that a situation may present to an organism a confused array of stimuli or an organized 'structure,' depending entirely upon the organism's prior experience of the world and of the same or similar situations? The 'configuration,' or organization of the stimuli is there in the situation by reason of the sequential order of nature from which the stimuli come, but the mere presence of the 'configuration' carries no certainty that the organism will pierce the confusion of concomitant stimuli and respond to any particular sequence of stimuli relevant to its activities. We need only reflect upon the different behavior of each genus, and almost each species, to the same situation to see that each organism 'perceives' or discovers or responds to a different 'configuration' in the situation, and ignores everything else. Thus there can be as many 'configurations' in any one situation (or as many tasks

⁵ What the Gestalt theorist means by 'closure' is apparently just this inevitability of the natural sequences of the world; once a sequence is started it must continue until it comes to a halt for various reasons, probably the changes in energy involved being controlling.

to be achieved) as there are different organisms and varying organic conditions. Indeed, if we will but recall the history of science we will see that there has been a progressive discovery of new 'configurations' and problems in situations which have been present to man (but 'unperceived') from the beginning of his existence as man.

Whether a situation presents a problem or difficulty to an organism depends upon whether it interposes time and space sequences between the organism and the activities essential to its functional continuance—food, mating, and escape from danger; again, the organic condition at the moment may render the organism more sensitive (or irritable) to food or to sex stimuli, so that the organism will 'ignore' stimuli otherwise significant.

Now the purpose of these remarks is to emphasize the bare fact that the specific 'configurations' which Köhler⁶ attributes to the situations in which his apes were tested are only some of many configurations; and this means that the 'configuration' is not another kind of entity or a more fundamental part of the world order, as some commentaries and critics have suggested: a 'configuration' or structure is a way of describing certain sequences of events and the stimuli they present to different organisms. This presentation of stimuli in an order or sequence arises from the world order of sequential events, which make it possible for the multiple sequences of each situation to be seized upon by each organism in accordance with the exigencies of that situation and its own capacities and organic needs.

At the risk of being tedious this point may be further elaborated and illustrated because its correct comprehension is of crucial importance for the problem of learning. In any given situation there may be as many problems or tasks as there are different organisms present, each of which has its own organic functions to be exercised as essential to living activity; the solution of those tasks by each organism will, to use the *Gestalt* formulation, come from 'insight' by the organism into the 'configuration' or organization of elements

⁶ See Köhler W., 'The Mentality of Apes.'

in the situation which are relevant to the task and the organism. Each organism will employ a different solution, making use of a different 'configuration': the ape will use a jumping stick to reach the suspended banana, and the bird or insect will fly up to the banana and perhaps hover around it while it pecks or bores the banana; the snake might creep up the support and out along the branch and down the suspending rope; the caterpillar or grub would also creep, and the man would probably untie the suspending rope if convenient or build up a platform underneath, or use a ladder, or knock down the banana with a stick, and so on. We can scarcely say that there is a 'configuration' present in the situation and that the 'insight' of one organism is superior to another. But if there are many possible configurations in each situation, does this imply that the world is subjective and constituted by perception? By no means. It merely indicates that the sequential order of events provides numerous opportunities for meeting the needs and exigencies of various forms of life, or interposes obstacles thereto, and that the specific 'problem' presented by a situation and the method or solution employed will depend upon the organism involved. This is true of any situation, even among inorganic elements, for copper provides opportunities to any acid to make a salt, in accordance with its specific atomic constitution.

'Configurations' or 'structures,' therefore, may be regarded as aspects of the sequential order of nature which arise in, or from, situations, in accordance with the exigencies of the case and the capacities or functions of the organism present therein. How they arise is, of course, the central feature of the problem of learning and this we must examine under the term 'insight' used by the *Gestalt* group.

As developed by the *Gestalt* theorists, 'insight' is the specific kind of behavior or response which an organism exhibits in the face of a problematic situation or task as preliminary to the solution of the problem (as contrasted with accidental or chance success); it is a taking stock of the whole situation, or rather, of all the elements of the situation which are involved in the problem or task. As the *Gestalt* statement

puts it, the animal shows 'insight' when it pauses, surveys the situation, 'reflects' and seems to ponder, and then proceeds to act in a manner which solves the problem, usually through an indirect way, and clearly indicates that the relevant situation was grasped. 'Insight' is therefore a form of comprehension or understanding, perhaps of intelligence (which term the *Gestalt* group deliberately avoids).

No one, I imagine, after reading the record of their experiments, will question the fact that there is a difference between this 'insight' approach and the mere random response to a cage, or to a puzzle (by an adult human). But it is difficult to see how the term 'insight' forwards the inquiry since it merely terminates the study with a convenient conception. As previously indicated, the *Gestalt* polemic against trial-and-error theories is well sustained, but it is in danger of lending aid and comfort, despite its objective aim, to animistic survivals in the form of mind-stuff, psychic perception and the like. We want to know what 'insight' is and how it works, since the whole problem of learning awaits the elucidation of the process covered by that term.

One clue to the mystery has been suggested above, in the statement that each situation will present a variety of 'configurations' or 'structures' (and problems) to different organisms, in accordance with the needs, capacities and functions of each organism. These differing needs, capacities, etc., we are beginning to discover, are specific adaptations or adjustments which, during the history of organic development, have been generated by interaction between organisms and environment. Looked at, in the large, we might almost say that in the evolutionary development of the various genera and species, we see what protoplasm has 'learned' from the sequential order of nature; this learning took place in different geological epochs and in different life zones, as climate and life zones changed and presented new problems to existing organisms. It happens that the 'solutions' of these new conditions of life were achieved by an alteration in the structure and function of the organisms which made the adjustment; and at present we are not clear how these

alterations took place and were perpetuated in succeeding generations. It seems probable that they would not have been perpetuated if the novel situation which evoked the change had not continued, and it may well be that the changing climate and life zones were altered in an accelerated manner so that each succeeding generation was faced with a somewhat more exigent situation requiring the adjustment. We need not speculate upon this problem, however, since for our present purpose it will suffice to say that a progressive differentiation of structure and function took place in organic life in response, apparently, to changing environmental situations and that when a generic adjustment had been worked out the organisms ceased to 'learn' or evolve further.

When we consider learning carefully, we see that the term refers to the acquisition or development of an altered behavior or function, from which we can infer a concomitant alteration of structure or organization. Thus the evolutionary development of the various orders may be viewed as a variety of learning, in which novel functions and structures were evolved. Furthermore, the learning of any action or behavior is *ipso facto* a form of evolution in which alterations in structure and function take place. We have then to consider two varieties of learning: an historical development of differentiated organisms, each of which has differing needs, capacities, functions, and organization or structure; and an individual organic adjustment wherein each organism, within the limits of the needs, capacities, functions and structure of its species (and of its individual needs, etc.) learns to deal with situations during its life period, by way of adaptation of its behavior and of its structure. The structural changes of the evolutionary development are apparent in fossils and other remains, from which we infer functional changes. By the same procedure, the behavior or functional alterations arising in the individual organism from learning, can be observed and we are forced to impute a concomitant structural alteration. This structural alteration may be too minute to be detected today, but its existence seems beyond question. It may be recalled that a change of phase in a colloid is a structural alteration and that the nervous system is made up of colloids.

To return to our problem of what is 'insight' and how does learning take place. It seems highly probable that each species, because of its evolutionary development, has developed ('learned') certain patterns or modes of response to its environment or life zone, as ways of carrying on its life functions. These are inherent in the individual organic structure and its growth to maturity is largely by way of realizing upon, or developing, those inherited capacities. These can not be transcended because the specific structure of the organism fixes the limit of its growth and its achievements. In familiar situations, only those factors or elements will be responded to, and only in that order or arrangement, which are appropriate to the organism's present condition and its specific capacity: birds will fly to the fruit in trees, squirrels will climb, and so on. Elements or objects and arrangements which do not relate directly to the inherited mode of life of the organism (or to the 'current business') will be ignored or avoided. That is to say, only those 'configurations' will arise and be present to an organism which are in accordance with its capacities and present organic condition, *i.e.*, which the species has learned to see and deal with and immediately is sensitive to. Individual variations within the species are, of course, to be expected, for the prior experience of the individual organism conditions its use of inherited capacities.

From the foregoing, then, it would appear that 'configurations' are particular sequences in a situation which each species of organism has 'learned' in the course of evolutionary development to employ in meeting a difficulty or a need essential to living. The 'configurations' or sequences employed by each species are those which are appropriate to its inherited structure and function, just as are the problems or difficulties and needs which generate the behavior. It may again be remarked that a problem or task is presented to an organism whenever the situation interposes spatial and temporal sequences between the organism and a functional occasion, such as food or sex; to solve the problem, the organism must move along the relevant sequences or initiate the essential sequences of events, which is usually the 'indirect

way.' A situation in which the organism can not proceed more or less directly usually arouses an emotional condition, as in times of 'danger.' If an organism has no functional tensions it may give no overt response to a situation, since there is no problem presented.

The taking stock of the situation before acting, which the *Gestalt* theory interprets as insight into the essential 'configuration' to be dealt with, seems to be a process of getting oriented, by waiting until sufficient stimuli have been received from the relevant sequences to evoke one of these responses appropriate to the problem or difficulty. Tentative efforts which hasten or improve orientation are to be expected, just as a dog runs here and there to verify a scent or a mariner scans the horizon and sky for his bearings. The fact that an organism is faced with a problem or difficulty or an ambiguity indicates that the stimuli to straightforward action are not present in unequivocal and direct order, but that there is some intervening space or time between it and the objective; hence, there must be a pause, a few tentative efforts or movements, until the stimuli of the particular sequences involved in successfully meeting the difficulty (*i.e.*, traversing the intervening space and time) can be received and the appropriate course of action evolved. In other words successful behavior is not always to be learned; indeed, in the lives of most animals, and especially the lower organisms, it is probable that the situations presented currently are so simple and true to the types in which the species evolved, that the organism responds directly and without a pause or hesitation, because the sequential stimuli of the situation and the organism's inherited structure and functions are so well adapted. When an ape successfully achieved a solution without any preliminary trials and errors or hesitation, Köhler says it was done 'without learning.'⁷

The foregoing is not intended to resolve 'insight' into

⁷ Köhler says that these straightforward solutions involve no learning because, no doubt, the subject does not require any preliminary process of getting oriented, beyond the pause, etc. As pointed out later, trial-and-error learning may be viewed as a process of getting oriented, so that the organism can deal with a situation in the same straightforward manner.

'instinct,' and to oppose concept with concept. It is rather intended to suggest that what the *Gestalt* theory calls 'insight' may be viewed as a process of orientation, by which I mean receiving two or more stimuli from a sequence or order, before responding, so that the response when made is a resultant or compound of the multiple stimulation, and is directed to the sequence of events presenting those stimuli. Such multiple stimulation may be of two general varieties: first, of two or more simultaneous stimuli, as in the case of light waves from two sources which, falling upon a heliotropic organism, will evoke a resultant response, as shown by the experiments of Jacques Loeb and his demonstration of the Roscoe-Bunsen Law; or second, of two or more consecutive stimuli which follow in either a spatial or temporal order and evoke a response which is oriented to the sequence of events or points from which the multiple stimuli are received.

Presumably the initial stimulus of the series or sequence evokes a response which is checked and deflected by the immediately following stimuli, so that the organism does not necessarily strike or respond at random to first one and then another stimulus, but having become 'set' or oriented by the successive stimuli follows a smooth curve from one point to the next or from one event to the next.

If the multiple stimulation is received only from the sequence of events or points which are essential to the resolution of the difficulty or to the achievement of the task, the organism may easily dispose of the problem; but if, as earlier discussed, the essential stimuli of the sequences involved in the successful activity are presented along with a confused array of non-essential or irrelevant stimuli, then the organism may be puzzled and hesitant. If it should respond to non-sequential stimuli, *i.e.*, those which do not lead to relevant events, it will accomplish nothing; while if it tentatively responds to the first and then to the second stimulus (or stage of presentation) of the sequence leading to the solution, it will be led along, so to speak, until it has completed the action essential to resolving the task.

To return, for a moment, to the discussion of evolutionary

development. It seems clear that each species has developed a peculiar and specific sensitivity or irritability to the stimuli of the sequences which are important, if not essential, to its life, and also a rapidity of getting oriented to those essential stimuli,⁸ so much so that in all probability the response is made directly to the total situation. That is to say, the trial-and-error learning which established this capacity for rapid orientation occurred in the evolutionary developmental past of the species; the random responses have all been done for the organism so far as its normal life zone is concerned.

When in its familiar habitat, each organism can, so to speak, solve any normal problem by 'following its nose' as we say, meaning by that, allowing the sequential stimuli to which it is especially sensitive to guide it. These special abilities may be exhibited only in peculiar situations or complex of stimuli or may be restricted to certain periods or epochs in the organism's life career, as in sexual behavior of maturity, in accordance with what Wheeler calls 'late ripening.' What is called an 'instinct' appears to be just this peculiar capacity to orient one's behavior to specific situations with a minimum of hesitation, errors, or tentative efforts. In the further study of instinct it would not be astonishing to find that so-called instinctive behavior was a response evoked by a highly specific stimulus or sequence of stimuli to which each species has developed an especial irritability, with a limited locus and chronology. This would transfer the present attention from the search for 'an inherited combination of reflexes,' supposed to control the response, to an inherited (and sometimes late matured) sensory idiosyncrasy or irritability. In support of this notion it may be urged that the overt behavior or activity in so-called instinctive acts is usually not peculiar and specific to those acts, but is part of the organism's normal and usual neuro-muscular activities, although there may be, in the consummatory phase of the response, unique neuro-muscular activity in the autonomic-sympathetic and the unstriped

⁸ The *Gestalt* criticism, of the trial-and-error theory's denial of any participation by the subject in the learning process, is well taken. What they call 'insight' is what each species brings to life situations as an evolutionary heritage and a product of its life experience.

musculature, such as swallowing, sexual orgasm, etc. Curiously enough, the proponents⁹ of various 'instincts,' as 'inherited combinations of reflexes,' omit such responses as in breathing, digestion, and so on, and speak only of the overt activities which are more or less dramatic, but common to a variety of life activities.

Returning to the question of 'insight' in problematic situations, such as those used by Köhler with his apes, there appear to be good reasons for saying that the concept of 'insight' applies to the behavior more generally known as orientation, which occurs before overt response to the situation. When we subject an animal to a totally alien situation and task (*i.e.*, one for which its life history and evolutionary development have provided no orientation) we are not testing its 'insight' or ability to handle that situation, in the sense of the term as used by the *Gestalt* group; we are rather testing the organism's ability to orient itself to a situation for which it has no 'insight.' This distinction is of real importance and may help to reconcile Thorndike's results with those of Koffka and Köhler.¹⁰

In the puzzle box experiments a hungry cat was placed in a cage with a latch on the door. The hunger, of course, was necessary to make it acutely sensitive to the food outside, *i.e.*, to create a problem situation, as discussed earlier. But the confinement in a cage from which it had to operate a latch to escape was, as Köhler has remarked, a situation beyond the cat's range of normal behavior, *i.e.*, a situation for which the cat was not oriented. The cat climbed, scratched, bit, etc., exhibiting every sign of fear and rage, or emotional excitement. If examined by appropriate means, such as Cannon has used, it is probable the cat would exhibit the usual glandular activity of emotions, with glycosuria, etc., which is the usual condition of an organism lacking orientation. In this condition the responses of the cat were random and aimless and it finally operated the latch only after exhausting the other possibilities. There was no indication of 'insight'

⁹ The *Gestalt* criticism of specific reflex arcs for each learned reaction applies equally to the conception of instinct held by McDougall and others.

¹⁰ Cf. Scheidemann, N. V., *PSYCHOL. REV.*, 1926, 33, pp. 64-67.

or of quiet orientation, as with Köhler's apes; the cat reacted, as we say, blindly and hit upon the solution by accident. In successive trials the preliminary biting and clawing was reduced until the cat 'learned' to operate the latch immediately upon confinement. The reduction in emotional excitement came with the increasing degree of orientation obtained from learning to escape.

To see how this trial-and-error learning takes place, according to the general viewpoint of this paper, we must recall, as earlier stated, that the world is made up of sequences of antecedent and consequent points and events, which are coterminous and simultaneous. That is to say, the sequences which must be employed to deal with a problem or task are presented in a situation along with a complex of irrelevant sequences. In the puzzle box the struggling cat was faced with the various parts of the cage, to each of which it reacted vigorously and without discrimination, since it had no orientation. It was not until it happened to respond to the antecedent of the specific sequence of events involved in escaping from the cage that it succeeded in getting out; specifically it was not until it operated the latch which was a fixed antecedent to opening the door (the consequent). When it reacted to the bars, its response was to a non-effective sequence or irrelevant sequence, and its impact upon the bars, which were relatively immovable, merely set up vibrations in the cage, etc. Only the behavior sequence of operating latch-opening-door could provide an escape.

Learning may be viewed as a process of conditioning, both positive and negative, by the stimuli of a situation. When a subject responds to concurrent or closely consecutive stimuli of a sequence and achieves thereby a task, we have all the necessary factors for a positive conditioning of the subject, so that the initial stimulus of the sequence will thereafter evoke the serial behavior appropriate to the consequents, *i.e.*, so that after responding to (1) the latch, and (2) the opened door, and (3) the food, the reappearance of (1), the latch, will evoke the behavior appropriate to the whole sequence of operating latch, opening door, walking out, and getting food. On the other

hand, when a subject responds to stimuli which do not initiate a sequence leading to the goal, he is negatively conditioned and soon stops reacting to them, as Triplett's perch stopped bumping their noses on the glass plate.¹¹

It is believed that the *Gestalt* type of response to problems, which are set within or just on the border line of the subject's ability and the field of activity of the species, also occurs through a process of conditioned responses. The essential differences between the trial-and-error process and the *Gestalt* response lies in the fact that the trial-and-error process is a way of achieving orientation to an alien situation, which is not necessary in the *Gestalt* experiments. Instead of a blind vehemence, Köhler's subjects approach the situation and the task acutely and deliberately, which means that they are using all their receptors and organic adaptations and orientation to that situation. Because the task is familiar it evokes 'insight,' an orientation which leads to fairly successful action, and the achievement follows (if it does) as a straightforward, serial activity. This whole procedure, therefore, strongly suggests conditioned responses, in which the animal's inherited capacities and past experience serve to orient the animal fairly easily to the relevant sequence of events; response to these sequential stimuli leads to completion of the task and the animal, therefore, is quickly conditioned positively to respond with the behavior appropriate to that task whenever the sequential stimuli or part thereof in the situation are presented again.¹²

The difference in the learning process here and in trial and error, is in the facilitation given by the orientation of the subject before it acts, and the absence of the emotional disturbance of the subject. The cat did not have any initial organic orientation, since the situation was novel and therefore

¹¹ See the writer's 'Suggestion for a Theory of Learning,' *PSYCHOL. REV.*, 1923, 30, pp. 145-148. Cf. Smith, S., and Guthrie, E. R., 'General Psychology,' pp. 119 ff.

¹² Past experience does not here imply any psychic or mental stuff, but refers to the alterations in structure and function occasioned by prior life history. Past experience is the name we give to this altered organism and it therefore exists in the present as a modified organism. See the writer's 'Locus of Experience,' *J. Phil.*, 1923, 20, pp. 327-329.

aroused emotional excitement instead of tentative action or the waiting for a succession of stimuli. Moreover, the cat had to be negatively conditioned to the bars before it eliminated its errors.

In trial-and-error learning the subject reacts to the situation at random until the sequence of stimuli relevant to the achievement is accidentally revealed or presented; this is a way of getting oriented, so to speak, by action, for as the record shows, in successive trials the subject takes less and less time to respond to the essential stimuli and the emotional disturbance is lessened. Also, the subject eliminates the random reactions to irrelevant stimuli, as it becomes negatively conditioned to them; sometimes the errors are not eliminated, as in cases where the subject fails to learn a solution to the problem, in which cases we have a development of patterns of response of a circular or repetitive character, which are non-adaptive.¹³

In learning by orientation the subject gets oriented, not by reacting overtly and blindly to the situation, but by waiting until the stimuli of the relevant sequence have been received, which set off responses addressed to the sequence of events leading to achievement of the task. These responses arise spontaneously and effectively in situations which present 'configurations' or sequences appropriate to the capacities of the subject, *i.e.*, to the range of activities for which the evolutionary development of the species has prepared them. In alien situations, the subject is usually aroused to emotional conditions of 'blind' reactions. So far as there is orientation there is little opportunity for negative conditioning, since few erroneous or irrelevant responses occur to be eliminated.

Where the solution or correct response is made accidentally and the subject achieves the task without prior orientation or 'insight,' no learning usually takes place, *i.e.*, no positive conditioning occurs, for the reason that the subject receives the stimuli of part of the essential sequence, but not all, and

¹³ Cf. Hamilton, G. V., 'Study of Perseverance Reactions in Primates and Rodents,' *Behavior Monog.*, 1916, 3, No. 2, pp. 1-65. Also his 'Objective Psychopathology,' 1925, p. 249.

so is not conditioned. This happens seemingly in this wise; the subject chances upon the initial step in the sequence essential to the achievement; in responding to this first step accidentally the subject is not 'prepared' or set for the succeeding stimuli of the sequence and so when they are presented they fail to register, so to speak; the sequence, however, is initiated by the subject's first reaction and continues, so that the task is achieved. The failure to respond to the succeeding stimuli of a sequence is not difficult to understand when we recall that these responses can take place only in so far as the subject responds to the initial stimulus adequately and is 'set' or put in position to carry through the response to the whole sequence. The accidental solution becomes explicable by noting that no skill is required to touch off a natural sequence; man has been initiating natural sequences accidentally during most of his career, as the history of magic and animism clearly shows.

In applying this analysis to the 'step-wise' phenomena or discrimination experiments, the situation seems to be this: the subject was trained to respond to the brighter of two shades of color and then later when the darker shade was removed and a still brighter shade added to the situation, the subjects responded to the new (brighter) shade. As Koffka points out, according to current conceptions and theories of association and learning of specific responses to specific stimuli, this result is inexplicable. But if we regard this as a case of conditioning the response to a sequence or order of stimuli, there is little difficulty in assimilating these discrimination experiments to the general theory of learning herein presented. That is to say, the subject was not conditioned to the specific brighter shade, but to a sequence of colors (an order of magnitude of brightness), so that the alteration of the absolute magnitudes did not affect the response; the new order evoked the same response as the same order of magnitude between two less bright shades. This is apparently the case in much of our learned behavior, especially to auditory stimuli; *e.g.*, we recognize musical progressions from one key to another, from one kind of scale to another; also we recognize and respond to

words uttered by various speakers of differing timbre, pitch, etc., of voice. In reading, also, we discriminate when we respond to the different order in which the same letters are presented, as we do in numerals, all of which indicate that the order or sequence of presenting stimuli is of importance in learning.

It appears therefore that we learn in two fundamental ways; first, from the stimuli given off by the sequence of points and events in any situation whereby the serial order of the stimuli presented in that order condition our successive responses; second, from the order or difference in magnitudes of two or more stimuli, whereby we are conditioned to respond to that order or difference with a differential response. What happens in the second type of learning is that we wait for the two or more magnitudes to be presented before we respond to the whole situation or order with a discriminatory response; in the first type we may wait for the sequence of stimuli to be presented before we respond to the whole sequence with a series of responses to each of the serially-presented stimuli or to the entire sequence.¹⁴

The *Gestalt* group have laid considerable emphasis upon the discrimination experiments as indicative of 'configurations' and also have developed the notion of 'a figure on a ground' by analogous experiments. They have said that the 'figure on a ground' is a fundamental mode of experience or perception and that it lends support to the theory of learning based upon 'insight' into the 'configuration.' If we reflect upon their discrimination and perception experiments, however, we will see that what they mean by a figure or configuration is the unequivocal presentation of a sequence of stimuli or an order of magnitudes (colors, sounds, etc.) which, in so far as they are presented unequivocally, must take precedence or outrank the other stimuli in the situation not so presented in a sequence or order. That is to say, the 'figure' appears

¹⁴ While the initial learning may require a separate response to each stimulus of a sequence, the later responses may be smooth and continuous, suggesting that a well-learned response of several steps is akin to a chain-reflex, in that an initial stimulus (after learning) will set off the complete activity. This very fact strengthens the case for conditioned responses.

and is presented on a 'ground,' because the 'figure' is the only explicit sequence and order in the situation; all other stimuli are (to casual inspection) non-sequential or without accompanying magnitudes of the same or similar character to establish an order of magnitudes. If a paper is covered with black dots of equal dimensions, uniformly distributed, there is no sequence explicitly given and no figure or ground; there is merely a scatter and we see either many dots or many white spaces alternately. If we have a 'figure' or form, we have, *ipso facto*, a spatial sequence or order of stimuli which are sufficiently alike to evoke a response to that sequence or order, while the other stimuli in the situation are, *pro tanto*, either dissimilar among themselves or lacking sequential or orderly arrangement. When these other stimuli are similar, as in ambiguous black and white border arrangements, we respond alternately to the 'ground' of white and to the figure of black, or vice versa.

It remains to note further that after a subject has learned to solve a problem, the problem may be altered to a large extent or put in another situation and still the subject will carry over its learning. This may be difficult to understand on the theory of conditioned responses, if the reader thinks only of the specific conditioning made familiar by Pawlow's classic work and more recent experiments. When two random or irrelevant stimuli are presented concurrently, as food and a bell, there is no sequence other than the arbitrary one imposed by the experimenter, and consequently this conditioning is unstable and easily inhibited by other stimuli equally irrelevant. But in conditioning by concurrent or closely consecutive stimuli which are presented by the natural sequence of points and events normally occurring in a subject's experience, we are dealing with a different kind of phenomena. Thus far, no experiments have been made specifically to test conditioning of this variety, except in so far as maze experiments may be said to do so, and these, as noted, are not normal to the subjects.

In the conditioning by a natural sequence or order, the subject is not always made sensitive to the *specific* stimuli of

the originating experience; rather we find that the subject may learn to respond to the order of magnitudes, regardless of the absolute magnitudes involved (within certain limits of course) or to a general sequence of events even when there is a large variation in the stimuli presented by that sequence from the original learning situation. It may be found that this capacity to tolerate variations from the original learning situation (to recognize analogies or similarities or to generalize, as we are accustomed to say) is a real measure of intelligence, which we can develop objectively and experimentally, instead of clinically. Apropos of which, it may be added that another measure of intelligence may be found in the span or interval possible between the conditioning stimuli for different subjects, since a subject may fail to learn or be conditioned because the interval occurring between the appearance of the several sequential stimuli is too long.

To sum up this long discussion, it seems possible to reconcile the trial-and-error theory with the *Gestalt* theory by recognizing that they each pertain to two stages of learning, as described above; in trial-and-error learning, the subject must first get oriented to an alien situation by blindly reacting thereto, while in the *Gestalt* experiments the subject is faced with situations to which it is already partially oriented, and so it merely waits for two or more stimuli of the relevant sequences to give it the correct approach or 'set,' this being possible because the situation is not alien, but native and normal. In the later stage of trial-and-error learning, as in the *Gestalt* type, the subject is conditioned to the relevant sequence of events and their stimuli.

The conception of 'configuration' and the notion of a 'figure on a ground,' employed by the *Gestalt* school may, according to this way of thinking, be viewed as two aspects of the sequential order of nature, in which points and events and magnitudes occur in an order or sequence. Again it appears that the conception of 'insight' is a case of orientation or getting the preliminary 'set' appropriate to a problem or task, by waiting until two or more of the stimuli given off by the relevant sequence of the problem are received.

The learning process, according to this view, is essentially the establishment of serial or integrated responses, through what we call conditioning; perhaps it would be more correct to say, the integration in a serial order of responses already within the organism's repertory, which became so integrated and established as serial responses because the stimuli of the situation are presented in that order by virtue of their origin in a natural sequence or order of magnitude. It seems clear that learning is a process of organic integration, involving the establishment of patterns of response from existing reflex arcs, and, equally significant, the establishment of those patterns as sequential to certain situations and their stimuli, through conditioning. Such conditioned responses may be either generalized or discriminative, according to the character of the learning situation and its controlling sequence or order.

The foregoing is offered not to prove anything or dogmatically to assert a theory of learning by conditioning, but to stimulate further experiments on learning in which some of the factors above discussed can be investigated. Unfortunately, much of the experimental work on learning recently has been seemingly lacking a problem; it is just repeating with minor variations the classic work of Thorndike. Finally it should be noted that the writer is not concerned with attacking the *Gestalt* school or trying to disprove its contentions. Rather it is intended to carry on their extremely interesting and valuable work which the writer wishes to acknowledge fully and with thanks for the stimulus it has given to his own thinking.¹⁵

¹⁵ The following problems are briefly noted as suggestions for experimental work on learning, to reveal the rôle of sequences and order.

- (a) Conditioning by naturally-sequential and non-sequential stimuli; rate of learning and duration under two methods.
- (b) Conditioning by non-sequential stimuli, with and without emotional excitement; speed of establishment and duration under two methods, also liability to inhibition by irrelevant stimulus after establishment.
- (c) Learning by conditioning to sequential stimuli of a task, with presentation of same stimuli later in non-sequential order.
- (d) Conditioning to non-sequential stimuli and presentation later of same stimuli in sequence leading to an achievement.

- (e) Evoking so-called instinctive reactions by artificial combination of the stimuli to which subject is specifically sensitive to see whether instinctive behavior is a matter of sensory idiosyncrasy which can be used to evoke instinctive actions in irrelevant situations; also using glandular treatment to arouse sensory idiosyncrasy in irrelevant situations or times.
- (f) Studying human behavior as essential learned responses, in which orientation, conditioning, etc., operate to establish the various patterns of normal and so-called abnormal behavior.

A BEHAVIORISTIC THEORY OF IDEAS¹

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In the course of writing this paper I have become more and more aghast at the number of separate items I have tried to pack into it. Far too many for clearness. And yet I don't know how I could have done otherwise. I wanted to introduce you to a new way of viewing things. And I felt that for my argument to have cogency, I must suggest my whole system and not limit myself to merely one feature about ideas, a feature such as might properly be encompassed in a single paper. The result, as you will see, is the following over-stuffed boa-constrictor of an affair with contents not wholly digested, and perhaps you will say by very nature indigestible. Anyway, so much for plea and for apology.

Turning, now, to the paper itself. In the first place, it is to be made clear that the theory of ideas I am going to present is merely a scientific or methodological hypothesis. I, as nought but a scientist, neither can, nor hope, nor, indeed, would want to attempt anything like a fundamental philosophical doctrine. For it is obvious that questions such as that of the final epistemological and metaphysical significance of ideas must be left to thinkers with wider foundations and a wider interest. As a mere psychologist, I am under compulsion to discuss ideas only from the one point of view of attempting to reduce them to a workable causal scheme. My only justification for speaking to you philosophers on such a matter at all is the presumption that you, whatever else the basis of your larger considerations, will also want to take cognizance of what we, the scientists of the moment, happen to be saying. It is, then, merely as one such scientist of the moment that I am proposing to you the following considerations.

¹ Read before The Philosophical Union of the University of California, April 2, 1926.

The orthodox psychologist, whom I shall oppose and whom we may call for convenience the 'mentalist,' conceives ideas as lying in, or as bits of, a unique type of conscious stuff. Ideas are described by him in their character as states or processes in this stuff. Overt behavior intrigues him only in so far as he believes he can infer conscious-stuff happenings from it.

Turn, now, to the behaviorists. We behaviorists, whatever else our divergences, are agreed in viewing overt behavior as the primary datum for psychology. It is from a study of such overt behavior and its environmental settings that we believe we will obtain our causal understanding both of the grosser activities of the lower animals, and of the higher conscious activities of human beings. Consciousness is for us but some moment or aspect in overt behavior.

But consider, now, more specifically the brand of behaviorism I shall present in this paper. For in order to understand my doctrine of ideas, you must first understand my notion of behavior simply as such. Behavior for me is not as it is for many, probably most, behaviorists primarily a matter of mere muscle contraction and gland secretion, of mere 'motions,' that is, described as motions. I conceive behavior rather as presenting a new and unique set of descriptive properties all its own,—new properties which, as such, can be described and known, irrespective of whatever muscular or glandular activities underly them. This new set of properties of behavior *qua* behavior is, of course, correlated with and probably completely dependent upon physiological motions, but descriptively and *per se* it is different from those motions.

"A rat running a maze; a cat getting out of a puzzle box; a man riding home to dinner; a beast of prey stalking its quarry; a child hiding from a stranger; a woman doing her washing or gossiping over the phone; a pupil marking a mental test sheet; a psychologist reciting a list of nonsense syllables; myself and my friend telling one another our thoughts and feelings." These are *behaviors*. And it is to be noted that in mentioning no one of them have I referred to, or, I blush to confess it, for the most part even known, what

were the exact muscles and glands, sensory nerves and motor nerves involved. For these responses somehow had other sufficiently identifying properties of their own. And it is these other properties in which, as a behaviorist, I am interested.

But what now, more specifically, are these other distinctive properties? Well, to begin with, we may note two important features which seem to run through and be found in all instances of behavior. They are *trial and error*, and *learning*. Any case of behavior, if not a product of past trial and error and learning, is, if unwonted obstructions be introduced, capable of new trial and error and new learning. The activities of the rat running the maze, those of the man riding home to dinner, and the rest, are peculiarly susceptible to such trials and error and such learning. Indeed, it is just because they are thus susceptible that they seem to differentiate themselves in our minds from activities such as the beating of the heart, the expansion and contraction of the lungs, and the other 'mere reflexes' of physiology. Let us consider these two features, then, in more detail.

First, *trial and error*. Thorndike's kitten in the puzzle-box went through a series of random 'trial and error' acts—clawing, biting, squeezing,—*until* by a chance clawing at the loop of string connected with the catch it got out. The author's own description was as follows:

"When put into the box the cat would show evident signs of discomfort and of an impulse to escape from confinement. It tries to squeeze through any opening; it claws and bites at the bars or wire; it thrusts its paws out through any opening and claws at everything it reaches; it continues its efforts when it strikes anything loose and shaky; it may claw at things within the box. It does not pay very much attention to the food outside, but seems simply to strive instinctively to escape from confinement. The vigor with which it struggles is extraordinary. For eight or ten minutes it will claw and bite and squeeze incessantly."²

Similarly, the rat in a maze exhibits the trials of turning here, there, and yonder, *until* it gets to the food-box. The man coming home for dinner goes through the trials of

² Thorndike, E. L., 'Animal Intelligence,' 1911, p. 35.

examining this street car, that street car, and the other, *until* he gets to the car that will take him home. And the child tries hiding behind this chair, that chair, and the other, *until* he gets *from* the sight of the stranger. In each case the trials (and errors) *keep on until* some particular and objectively discoverable end-object or situation is got to or from. But this is tantamount to saying that each such series of trials and errors exhibits a purpose to get thus to or from. The cat's trials are quite objectively exhibiting the purpose to *get to* the outside of the cage; the rat's runnings-about that to get *to* the food-box; the man's examining of successive cars that to get *to* house and dinner; the child's hidings that to get *from* the stranger. These purposes to get to or from are part of the very descriptive texture of the act.³

But here a 'mentalist' may perhaps protest. "Very true," he may say, "trial and error *do* exhibit purpose. But purpose is a mental phenomenon, and if you admit it, you are ceasing to be a behaviorist." "Not at all," I must reply. "The purposes we have here observed, these purposes which exhibit themselves in trial and error, these *persistences-until*, are not mentalistically defined entities at all, but behavioristically defined ones." To a mentalist, a purpose, if he sticks to his fundamental postulates, must be essentially an introspectively get-at-able affair. The purpose he means must be, in the last analysis, a 'content,' 'process' or 'function' which is found introspectively within his or somebody else's *consciousness*. The purposes we have been pointing to, on the other hand, are different. They are discovered by looking *at* another organism. One observes that the latter *persistent* through trials and errors *until* a given *end* is *got to* or *from*. Such a purpose is quite an objective and purely behavioristic affair. It is a descriptive feature immanent in the character of the behavior *qua* behavior. It is not a mentalistic entity supposed to exist parallel to, and to run along side of the behavior. It is *out there in* the behavior; of its descriptive warp and woof.

Turn, now, to the second feature, *learning*. Not only do organisms vary and persist in their responses until they finally

³ See also, Tolman, E. C., 'Behaviorism and Purpose,' *J. Phil.*, 1925, 22, 36-41.

get to or from, but they also upon successive occasions repeat more readily those particular responses which have proved to lead most easily or most quickly to or from. That is, they learn. For example, white rats can learn to select, up to a certain measurable difference, the shorter of two alleys leading to food. But such a fact indicates not only that they have the purpose to get to food, but that they also do, within limits, cognize the shorter versus the longer way. Behavior *qua* behavior exhibits not only purposes, but also *cognitive postulations* as to the nature of the environment for mediating and supporting the purposes.

We have, then, these two conclusions: (1) Behavior expresses immanent purposes,—purposes which exhibit themselves as persistences through trial and error to get to or from. And (2) it expresses, as is indicated by the facts of learning, immanent cognitions,—cognitions as to the nature of the environment for mediating such gettings to or from. It is these cognitions which are of chief interest to us tonight. They are *ideas*, at least in some sense of that word. And our remaining task is simply that of working them out more clearly.

As our first step, we may note their transcending, reaching out, or, as Professor Adams has called it, 'setting up of a claim' character. For the very essence of these 'in-behavior' ideas is to make postulations or claims as to the environment. For example, consider a rat which has completely learned a maze, so that when put in at the entrance, he dashes through like a shot, turning here, there, and yonder, entering no blinds and arriving at the food-box in only some four or five seconds from the start. Suppose, now, one of the alleys be considerably shortened between trials. What happens? On the trial after, the animal runs kerplunk into the new end of the alley. In short, he acts as if the old length of alley were going to be still present. His behavior postulates, expects, makes a claim for that old length. It must be noted, however, that our evaluation of his claim involves a knowledge also of his purpose. It is only because we know (or assume) that the rat does not want to bump his head, that we can rightly conclude

that his bumping exhibits a postulation for an alley of the old length. If he had wanted to bump, then this very same act of running and bumping would have exhibited a postulation for the new shortened length. To rightly evaluate behavior-cognitions, we must, then, at the same time rightly know and evaluate the controlling purposes.⁴

What, now, are the purposes? Fundamentally, as we have already seen, they are persistences to or from. But to or from what? We will answer quite dogmatically, without here attempting to present the argument, that they are persistences to or from, finally and in the last analysis, states of bodily quiescence or of bodily disturbance. External environmental objects are got to or from only as means to or from these bodily states. It goes beyond the task of this paper to argue for a particular enumeration of these final states. Suffice it to say that my predilection is for a relatively short list. Food-hunger, sex-hunger, shelter-demands, excretion-demands, fatigue-demands, and æsthetic-demands complete what I should consider as the final list of ultimate *appetites*, or drives *towards quiescences*; and fear and pugnacity the final list of ultimate *aversions*, or drives *from disturbances*.⁵ Others will perhaps not agree with this list. The important point for this discussion, however, is merely the doctrine that all behavior-purposes do thus reduce ultimately to drives to or from final physiological states, and that all other objects or situations are, in the last analysis, got to or from only as routes or means for getting to or from these bodily states. Appetites and aversions plus external stimuli constitute the final determiners of behavior. It is the already aroused condition of the appetite or the aversion which alone sensitizes the animal to external stimuli and causes him to postulate therefrom the characters of the intervening environmental objects which he must traverse or manipulate. Or, putting this pictorially, we may liken the environment to a multi-dimensional spider's web radiating out from the behaving

⁴ See also Tolman, E. C., 'Purpose and Cognition: The Determiners of Animal Learning,' *Psychol. Rev.*, 1925, 32, 285-297.

⁵ See also Tolman, E. C., 'The Fundamental Drives,' *J. Abn. Psychol.*, 1926, 20, 349-358.

organism in many directions. The far ends of the threads terminate in final to-be-sought-for quiescences, or final to-be-avoided disturbances. Environmental objects and situations are responded to and cognized only in their character of providing bridges or routes along these threads.

Turning, now, to analysis, we shall find that these behavior-cognitions subdivide into three types or elements which may be termed respectively: (1) postulations of discrimination-features; (2) postulations of manipulation-features; and (3) postulations of relative positions and orders among discrimination- and manipulation-features.

First, *discrimination-features*. The release of a behavior-act postulates certain stimuli. That is, the going off of that one behavior-act rather than of some other constitutes an assertion as to the characters of the stimuli which are present. Consider, for example, the sensory-discrimination experiment as used with the lower animals. The apparatus consists of a rectangular box or choice chamber from which two exits lead. From the standpoint of the animal, say a chicken or a rat, who enters at the end of the box, one exit leads out from the far right-hand corner and the other from the far left-hand corner. A partition projects out from the opposite wall and comes part way toward the animal, separating the ways to the two exits. To choose the right-hand exit, the animal has to pass to the right of this partition; to choose the left-hand one, he has to pass to the left of it. The experimental procedure consists in facing the animal with a pair of cue-stimuli, say, two colors, one on the right and the other on the left, but arranging it so that, in any given trial, the one color, perhaps red, will always be on the side of the opened exit, and the other, perhaps yellow, on the side of the closed exit. In other words, if the animal goes toward the red side whether this in the particular trial be right or left, he is allowed to get through and he receives food; but if he goes toward the yellow side, he finds the door shut in his face and may even be punished further by an electric shock. If he is capable of discriminating, he will in time learn always to go toward the red and to avoid the yellow, whichever sides, right or left, these happen to be on in the given trial.

But such behavior illustrates very prettily what I mean by discrimination-postulation. For this always-going-toward-the-red rather than toward the yellow must be said to assert, or make a claim as to the specific discrimination difference between these two kinds of stimuli. For a complete definition, however, we need further experiment. We need to try substituting other wave-lengths for the given ones to discover which of these others would be accepted as equivalent for discrimination-purposes. We should probably find, for example, that quite a large range of long wave-lengths could be substituted for the initial red, and another quite large range of shorter ones for the initial yellow. Or in the case of the rat, we might find even that the initial red was really being reacted to as equivalent to no light at all, so that as long as there was some light on one side and none on the other, the animal would continue to react in the same fashion. But, in any case, the first step in our definition would consist in listing all these other color stimuli which could experimentally be substituted for the given ones. But even this would not be enough. For the final definition we should want to know also all about the whole system of interdiscriminabilities for this organism. We should want, in short, to know such a complete system of interrelationships as that which is represented for human beings by the Titchener color-pyramid. For the color-pyramid, as you will remember, is simply the schematic way of representing the whole system of interdiscriminabilities of visual stimuli for human beings. We need, then, an analogous color-pyramid or color-polygon for each organism. And not only a color-polygon but, of course, also smell, touch, sound-polygons. Having such polygons, we should then, finally, define the given postulated discrimination-features in any such experiment, first, by listing all the substitutable and all the non-substitutable stimuli, and, secondly, by locating these respective substitutable and non-substitutable stimuli in their respective places on the given sense-polygon.

We must note, however, that what we have thus been saying for these cue-stimuli would really apply as well to all

the other stimuli involved in such a behavior. Thus, for example, in this same experiment the animal's method of running to the one side or the other expresses not only postulations as to the discrimination-characters of the cue-stimuli, but also as to those of the visual, tactual, olfactory, and other stimuli coming from floors and walls and doors. The animal only goes the way he does because also of what he postulates as to these other stimuli. But here again experiment would show that certain stimuli could be substituted for these given ones and others could not. So that the final definition of what was postulated would again be in terms of the substitutable stimuli plus their specific positions upon the given sensory-polygons for the given animal.

Finally, suppose that instead of a rat or a chick, it was a human being we had been concerned with and that instead of making him run in a discrimination-box to the red side or to the yellow, we merely asked him which was red and which was yellow. What more should we have learned? We should have learned that for him a range of wave-lengths around the red part of the spectrum can always be discriminated from another range around the yellow part. And we should have located these 'reds' and 'yellows' upon his color-pyramid. But we should have learned nothing else, except, of course, that his color-pyramid happened to be like ours and that he had been taught the same names for the 'red' and 'yellow' bands of the spectrum that you and I have. We should never have learned how these colors felt 'inside' his mind, assuming with the mentalists that his mind has an inside. What they may be as private mental 'feels,' if there are private mental 'feels,' would not have entered into our account. And, indeed, it never did enter even into the results of the introspectionists, whatever they themselves may have thought to the contrary.⁶

We may turn, now, to the second type of behavior-postulations, that of *manipulation-features*. The release of a behavior-act postulates in the environment not only certain

⁶ See also Tolman, E. C., 'Concerning the Sensation Quality: A Behavioristic Account,' *PSYCHOL. REV.*, 1922, 29, 140-145.

present and immediately-to-come stimuli, but also what, for want of a better name, I shall call certain specific *supports*. A behavior-act postulates, that is, such real physical entities as sizes, shapes, weights, inertias, resistances, to serve as actual supports for itself. In order to stand, to walk, to climb, to run, to swim, to make noises, an organism requires and must have such and such physical supports as a solid surface to walk on, a physical height to climb over, an unobstructed stretch to run in, a liquid to swim in, and a gaseous medium to vocalize with. An organism requires and postulates these supports. That is, to return to the above experiment, the animal's going to either side postulates not only the discrimination characters of the two cue-colors and of the visual, tactual, olfactory stimuli from floors and walls, but it postulates also such manipulation support features as the capacity of the floor for holding his weight, and of the geometry of the box for permitting him to turn at such and such points. The organism, in behaving, holds two sorts of intercourse with his environment. He senses it; that is, he postulates stimuli or discrimination-features; but he also tries actually to manipulate it; that is, he postulates supports or manipulation-features.

To define, now, in any given case these postulated manipulation-features, we must discover, first, what other supports besides the given one could and could not be substituted and have the same behavior sustained. Secondly, we must discover also what other responses these given supports could likewise sustain. We must, that is, work out an algebra between physical supports and resultant manipulation-features analogous to that algebra which our sense-polygons express as between stimuli and resultant discrimination-features. We must know that while a thing of the size and shape and weight, etc., of a chair will, for a man, present manipulation-features such as to be sat-on-ness, to stand-on-ness, to jump-over-ness, to pick-up-ness, and to use-as-a-weapon-ness; for a rat, it will present quite a different set of manipulation-features, those, say, of to build-a-nest-in-ness or to hide-behind-ness.

Finally, we may note certain significant and philosophically interesting relationships between manipulation-features and discrimination-features. Discrimination-features function as signs for manipulation-features. For instance, I am now leaning (in a somewhat trembling fashion) against this desk. But this particular behavior results first from certain postulated discrimination-features which I locate in the desk, those, for example, of its visual size and shape, plus certain of its touch qualities. These act as signs for my further postulation of its manipulability as something capable of being leaned against. The desk, however, has other discrimination-features, for example, those of color and temperature, which, however, in this situation do not function as indicating to me anything about its lean-against-ability. Not all discrimination-features, then, are in any given situation signs of manipulation-features, but certain ones only. But here we strike up against, do we not, the old classical distinction between the 'primary' and 'secondary' qualities? Visual size and shape, pressure sensations, and the like, are primary qualities. Color and temperature are secondary qualities. The former indicate specific manipulation-features; the latter do not. It must be noted, however, that this difference is merely functional and with reference to specific situations. That is, the orthodox list of primary qualities contains those discrimination-features whose associations with specific manipulation-features are relatively fixed and universal; while the orthodox list of secondary qualities contains those whose associations with specific manipulation-features are less consistent and less frequent. Visual and tactual size and shape and number and pressure are pretty uniformly indicative of specific sizes and shapes and weights defined as supports or manipulation-possibilities. Colors and temperatures, on the other hand, are not so uniformly indicative. As aforesaid, however, the distinction is only relative. For these so-called secondary qualities do often have definite indicative-values, at least for specific situations. Thus, for example, the color may well be the significant cue for the housewife who needs an apple and dives rapidly into box or basket or cooler shelf,

half filled, as it usually is, with a medley of oranges, lemons, apples, and tissue-paper wrappings. In such a case it may well be that it is the distinctive *color* of the apple which indicates to her quickly the whereabouts of the latter's specific manipulability-features. And there is also the opposite fact. The so-called primary qualities themselves do not always have absolutely fixed and invariable implications,—witness our old friend the bent stick half in water and half out. The difference between primary qualities and secondary qualities is one of degree rather than of kind. It was easier for God (or the Devil) to arrange it so that colors and temperatures and tastes can be more easily smeared on and off the surfaces of things than can visual and tactual shapes and sizes and resistances. But that is the only difference. Discrimination-features, whether primary or secondary, always remain but discrimination-features. Visual and tactual shape and size and resistance, as such, *i.e.*, as pure discrimination-possibilities, are no more at one with their indicated manipulation-possibilities than are color and smell and taste. Both sets are mere signs for these manipulation-possibilities.

We turn, now, to the third type of behavior-postulations, that of *positions*, or orders among discrimination and manipulation-features. The release of a behavior-act postulates not only qualities and meanings, *i.e.*, discrimination and manipulation-features, but also orders and sequences or positions among the latter. But first we must note that the discrimination-features which serve as signs for manipulation-features seem to unite with the latter into what may be called the ultimate units of behavior. These units of behavior, however, can be of very different degrees of generality or extensiveness. For not only 'entering an alley,' 'clawing at a loop,' and the like, are to be described as such units of behavior, that is, of discrimination manipulation wholes, but also such more extended operations as 'getting out of the box,' 'running through the total maze,' 'buying a house,' 'going to Europe,' or even 'embarking upon a career.' But in these more extended units it is obvious that the defining discriminations and manipulations must be less specifically detailed than in

the cases of 'clawing at a loop,' and 'entering an alley.' A wider variety of different particular stimuli and of different particular supports can be substituted in them and have them still preserve their defining characters. All that is necessary is that the general pattern of discriminations and manipulations remain the same. And here, it may be noted, is where the *Gestalt* psychology comes in. For the *Gestalten*, as I see it, are just such discrimination-manipulation units, which, as the *Gestalt*-psychologists themselves have emphasized, do retain their specific defining outlines in spite of wide changes and variations among their constituent elements.

Finally, we must note that these discrimination-manipulation units compound together into larger complexes. And such a compound may be formed in either of two ways: (1) two discrimination-manipulation units may come together as two coördinate successive links where the one is merely the necessary forerunner of the other; or (2) they may be combined rather as one superordinate to and inclusive of the other. For example, in the case of the kitten in the puzzle box, the two acts of 'getting out of the box' and of 'eating the food' are connected in the first fashion, the one merely the coördinate forerunner of the other. The two acts, on the other hand, of 'getting out of the box itself' and of 'clawing at the loop of string' are instead related in the second fashion, the former as superordinate to and containing the latter. But in both types of case the one act is a means to the other, and, as such, lies in a specific position-relation to it. Thus, for example, 'getting out of the box' lies primarily in a spatial position with respect to 'eating the food,' while 'clawing at the loop' lies primarily in a mechanical position with respect to 'getting out of the box.'

Our problem is, then, how and to what extent does the animal postulate these position-relations? We require in each case an experimental answer. We might, for example, in the case of our first pair of behavior-acts, put the food in other directions outside the box, to discover thus if the directions of the getting out are or are not affected. Does, that is, the animal struggle primarily only against that side of the box

which is towards the food, or does he struggle with equal readiness against all four sides? Can his insight into the position of the food 'as outside' be defined as recognizing the notion of the box as a four-sided container, or is it limited rather to the notion of it as a mere face-on barrier? For the cat it would probably turn out to be the former. His behavior would probably express an insight into, a postulation of, the four-sidedness of the box. If, in contrast, chickens were put into the same situation, those of us who have kept hens in our youth know full well that they would oscillate back and forth (in the most irritating fashion) on the one side of the box nearest the food. Their position postulations would, in short, be limited to the simpler notion of 'face-on barrier.'

For the other example, that of pulling the loop of string to get out, we should need to try substituting different actual mechanical connections between string and door; connections which the animal could see and ones which he could not; connections which were simple and direct, or ones which involved higher principles, such as that of the pulley and of the lever; and connections in which the temporal sequence was rapid and one in which it was slow. But for the cat we should probably find that the loop was merely equivalent to any other part of the cage; that his response expressed no greater mechanical insight into the situation other than, perhaps, that the loop is something relatively loose and shaky. If, in contrast, we were to put a chimpanzee or a child in the same situation, we should no doubt find that the simpler structural connections between string and door would lead to his pulling sooner. The behavior of these animals would, in short, exhibit some mechanical insight. A chimpanzee, as Köhler found, is capable of manufacturing tools such as the piling of boxes and the fitting of two short bamboo rods together, in order to reach in roundabout fashion goals, the direct spatial routes to which are blocked. This suggests relatively complex and ramifying systems of spatial and mechanical position postulations in these animals. Discrimination-manipulation objects lie inside one another and beyond one another, spatially, temporally, mechanically. And organ-

isms, in so far as they behave correctly to such complexes and chains of objects, postulate, have insight into, not merely these objects themselves, but also their spatial, temporal and mechanical interrelationships.

We may stop now and sum up the argument to this point. The release of any behavior-act expresses, contains immanently within itself, postulations or reachings out. And these are, as we have seen, (1) postulations of specific stimuli or discrimination-features; (2) postulations of specific supports or manipulation-features; and (3) postulations of specific positions or orders among discrimination and manipulation-features. Or, in terms of orthodox tradition, may we not say, postulations of qualities and of meanings and of interrelations among meanings or among qualities. Such are the 'in-behavior' ideas. And these ideas are in the most well established habits as well as in the more recent and newly acquired ones. And in defining none of them have we had to rely on introspection or assumed anything as to conscious awareness. The time remaining is short, but we must nevertheless still say a word about this matter of conscious-awareness. What sort of behavior-acts would our theory assume as exhibiting not only such postulations, but also what the introspectionists call conscious-awarenesses? Our answer is simple. Conscious-awareness is for us but a unique type of postulation. It is a postulation which not only postulates but which brings the postulated into the present and makes it one of the determiners of the behavior-act itself. And it is achieved whenever an organism is able, instead of actually behaving, to make a mere adjustment for that behavior. Such adjustments bring the postulated results into the present. For consciousness, as Professor Bode would say, is the 'bringing of the future into the present.'⁷ It is a *representation* of results so that the latter can themselves become determiners for or against the act which leads to them. If these represented results are 'good,' the impulse toward this act can thereby momentarily and suddenly be reenforced; if 'bad,' it can be weakened. Wherever there is a sudden drop in the learning curve, there there is consciousness. For only

⁷ Bode, B. H., 'Creative Intelligence,' Holt, 1917, 228-281.

by representation of its results (through memory or imagination) could acts hitherto infrequent become thus suddenly and consistently frequent.

By virtue of such representation the organism is able to evaluate the result of his act, and to release it or not to release it, as the case may be. If the result is in harmony with the already released and controlling larger act, then the given act is evaluated as good, if not, it is evaluated as bad, providing the animal has insight into the given position-relations. This insight, however, may be of different degrees: (1) the organism may merely 'feel' whether these represented results are ones which if actually presented would themselves, given the larger act, lead on to still further behavior. Or (2) if he is of a superior type, he may even represent the results of still further behavior which might lead from these first represented results; and so on through a whole chain of successive representations.

Perhaps this will all be clearer from examples. Imagine again the kitten in the puzzle box or the rat in the maze. Have we anything like objective evidence of consciousness or representation in their cases? The act of clawing at the loop, or of entering a given alley I would assert to be conscious in cases where the animal can be observed to hesitate for a moment between clawing and not clawing or between entering and not entering. I have not myself worked with cats in puzzle boxes, but I have worked with rats in mazes, and I have seen at certain stages in their learning very patent instances of such hesitation at a choice point between two alleys. The rat stops and wiggles his nose from side to side, and then finally chooses. And I have noted further that in such cases he usually chooses the correct one, more often than when he does not hesitate. There are, in short, real little drops in the learning curve at such points. And I assume therefore that there is consciousness. But how much does such representation amount to? My guess is that for these cases of the rat or the cat it amounts to very little. It is probably a representation of only the very immediate consequences of the act, a provision, perhaps, of the opening door in the case of the cat, or of merely the immediate free space

ahead in the case of the rat, of hardly more than is included in the mere perceptual properties of the situation. But these represented slightly farther-on-nesses are ones which when actually present have been 'good' in the sense of having led successfully on previous occasions to further responses which were consonant with the larger controlling acts. Their representation therefore helps the animal to decide and to release the act leading to them. I doubt, on the other hand, if these animals are capable of anything like long trains of representations based upon these first representations. I doubt if the rat can represent not only the end of the immediate alley, but also the fact that this end opens into such and such another alley, and so on.

Turning, however, to human beings, or to chimpanzees, there are suggestions of just such chains or trains of representations. The chimpanzee was observed struggling to make one longer stick out of two shorter ones, in order to use this latter for reaching the food. Such behavior, when it first occurred in non-routine, non-automatic fashion, certainly suggested a representation by the animal of the longer stick and then a further representation of using this longer stick to reach the food. It suggests that he held up the immediate act in the form of a mere adjustment in order to represent its end, and that he then made a still further adjustment to this end in order to represent a still further end, and so on. But if so, then this was in embryo all that we mean by a train of thought or reasoning, as we find the latter in human beings.

But you may ask how, upon such a behavioristic model, can we allow for any but trains of concrete thoughts? How is our behavior-model to care for generalized and abstract thinking? How is it to allow for the tedious flights of speculative fancy found in the papers of philosophers or even of psychologists? My answer is that philosophic animals can apparently adjust not merely to absent represented discrimination-manipulation-possibilities as well as to present ones, but that they can also adjust to universalized discrimination-manipulation possibilities. For example, they can adjust for and prepare to behave to not merely a given specific pair of pairs, but also to all sets of pairs of pairs. They can declare, in short, that two

plus two always equal four. They can abstract in their behavior adjustments from the specialities of a given case and adjust only to its generalities. But, even so, they can not make adjustments to anything other than the behavioristic discrimination-manipulation or interposition properties of objects. The world for philosophers, as for rats, is, in the last analysis, nothing but a maze of discrimination-manipulation possibilities, extended or narrow, complex or simple, universal or particular.

Finally, one last word. I know I can not hope in such a short space to have made this discussion of consciousness and thinking other than hopelessly chaotic and superficial, and particularly I feel certain that the die-hard mentalists among you will feel that I have been illicitly relying on introspection. My answer to this last charge, however, will be that introspection is for a behaviorist also a form of behavior. It is a surprising but none the less purely *behavioristic* fact that human beings can not only discriminate and manipulate in gross manner but they can also perform the very refined behaviors of using gestures, verbal or otherwise, to influence and to manipulate their fellows. They can say: "See this desk I am leaning against," or "Hear this noise I am making," or "Note this all-gone feeling I now have in the pit of my stomach," or "Let me tell you what I represent to myself if I try to describe all human activities on the analogy of a rat in a maze."

Human beings can do all these things, but they can not convey *per se* private mental contents to their fellows. If their fellows do not understand what they are talking about, then all they can do is to point and grossly to behave. Or, better yet, they can take their fellows over to a really good laboratory and show them a really good rat in a really good maze, and say, "See, this is what I mean, this is the sort of thing that is going on in my mind." I may have private mental contents, but if I have, only God and myself will know them. All you can ever know is what postulations and representations are waiting to get themselves expressed in my behavior, as those of the rat there are getting themselves expressed in his.

THE HYPOTHESIS OF INHIBITION BY DRAINAGE

BY WILLIAM McDOUGALL

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Dr. Raymond Dodge has recently published a series of articles on inhibition in the nervous system in which, while reviewing the whole problem, he is more particularly concerned to refute the drainage hypothesis. I have long been so far out of touch with physiology that I feel myself quite incompetent to discuss the topic; yet I am stimulated by Dr. Dodge's careful and impartial criticism to offer, with the greatest diffidence, the following observations.

Dr. Dodge attaches great importance to two facts as being incompatible with the drainage hypothesis. First, he points out, "there is evidence . . . that axone conduction consists of an electro-chemical process, in which the excitation at each point of the axone becomes the condition for the excitation of the neighboring points." I have always held that this view of the excitation process is well founded, but I have seen no incompatibility between it and the drainage hypothesis. Accepting the view that conduction involves the spread of an electro-chemical change communicating itself from point to point of the nervous substance, may it not be, is it not highly probable, that this chemical change is one that involves transformation of energy from the potential or latent chemical form to the active form, in other words, liberation of active energy within the neurone? If such liberation takes place in every part of the neurone traversed by the wave of excitation, what becomes of the freed energy? Are we bound to assume, can we assume with probability, that the energy liberated in each unit-section of the axone is consumed, diffused, or rendered latent again in the process of inducing excitation in the neighboring section? If a train of gunpowder is fired, does not the process of conduction involve, besides the spread of the excitation from section to section, the liberation of

energy in excess of that required for the spread of excitation? If the gunpowder lies in a narrow tube from which the liberated energy can escape at one end only, there will be a double process of transmission along the tube; namely, first, the spread of the excitation process, secondly the flow of liberated energy along the tube towards its open end.

The insulated axis cylinder seems to be similar in many respects to such a train of gunpowder in the rigid tube open at one end. What difficulty is there in regarding the process taking place in it as similar to the double process of transmission in the tube? Are we not almost compelled to regard it as closely analogous?

In close connection with the foregoing objection to the drainage hypothesis, Dodge makes the assertion that the analogy with the flow of energy in a tube "implies decrement between the nervous action at the exit of the nerve fiber from the neurone cell and its termination in the end brushes." Now this statement seems to imply that the flow must be analogous to the flow of fluid along a tube occasioned by decrement of pressure at one end. But, if the analogy with the excitation of gunpowder be valid, there may be no decrement of the excitation process and a mounting pressure of energy within the tube which occasions the discharge of energy at the open distal end. Is there any positive evidence that there is no such gradient of pressure? I do not know, but I imagine there is none. Rather, the fact that energy does escape from the distal end of the axone across the resisting synapse or end-plate seems to be sufficient evidence of a rise of pressure or potential within the axone. Such rise of potential of free energy and consequent discharge across the synapse, in consequence of excitation, is all that the drainage hypothesis demands from the neurone.

Dodge's main objection to the drainage hypothesis is founded upon experiments, in which he produced voluntary innervation of certain muscles in response to the same sense stimulus that produces reflex contraction of those muscles (quadriceps and eyelid wink muscles) or other muscles. He argues that "If the drainage theory is a fact, then the knee-

jerk (and the eyelid reflexes) which are accompanied by this voluntary reaction should be either totally inhibited or consistently diminished in extent as compared with those in which no voluntary reaction occurs." He finds experimentally no such inhibition and regards this finding as strong or even conclusive evidence against the drainage hypothesis.

Here I fail altogether to follow Dodge's reasoning. I cannot admit that the drainage hypothesis necessarily implies such inhibition of the reflex by voluntary innervation. First, the voluntary innervation must follow the reflex innervation in time; and if the two paths were in such relations that the activity of the cortical path must inhibit any simultaneous excitation through the spinal or subcortical level, it might well be that the time interval would be sufficient to prevent the inhibition taking place. But further—Is there any sufficient ground for the assumption that, even if simultaneous, the voluntary must inhibit the reflex innervation? I cannot see that any such assumption is implied by the drainage hypothesis. Sherrington has shown how the relations of two different paths may involve either reënfacement or inhibition when they are simultaneously excited. It is not necessary to assume that every neurone path is in relation of reciprocal inhibition with every other. Reënfacement is a fact, no less than inhibition; and in terms of the drainage hypothesis, the result of simultaneous excitations of different paths must depend upon the synaptic arrangements concerned; under one arrangement inhibition, under another reënfacement.

I would therefore urge Dr. Dodge to make clearer the reasoning upon which he bases his deduction from these experiments. At present I cannot accept it as conclusive or even well-founded.

In conclusion I would urge the importance of the consideration of a most striking and indisputable phenomenon, one which Dodge, like almost all who have discussed this problem, neglect to consider, yet which cries aloud for some interpretation in terms of the neurone processes. I mean the phenomena of concentrated effort. Let us confine our consideration to efforts of muscular innervation. It is a fact that we can

and do innervate a set of muscles (say those which produce closure of the hand) with varying degrees of intensity. A subject gripping a dynamometer may squeeze it with a pressure ranging from a few milligrams to 100 kilograms. And the higher pressures require a maximal voluntary effort. I believe that no reflex innervation can equal the strength of the contractions produced by such maximal effort (though I am subject to correction here). If the all-or-none principle is generally true, then the voluntary effort succeeds in producing excitation of a larger number of motor neurones than do lesser efforts and reflex innervations. If the all-or-none principle is not valid, the greater effort produces a higher intensity of excitation in the motor neurones. In either case there would seem to be effected some concentration of energy in the motor neurones such as cannot be effected by reflex excitation. And the degree of inhibition upon other processes seems roughly proportional to the degree of effort and of concentration. That is a leading fact which is strictly in harmony with the drainage hypothesis and which seems to be entirely incapable of interpretation in terms of any other view of the inhibitory process.

I do not suggest that the drainage hypothesis explains the concentration. As I pointed out long ago in my 'Physiological Psychology,' the concentration of energy manifested in voluntary or in instinctive effort seems to be a very peculiar phenomenon, perhaps one strictly inexplicable in terms of the inorganic sciences. I suggest merely that it harmonizes with the drainage hypothesis.

I would urge also the importance of another phenomenon to which I have long ago drawn attention, one which is in a sense the converse of concentration. Namely, when, as in an ergographic experiment, we make repeated efforts to contract one set of muscles with maximal force, we at first seem to succeed in concentration of the innervating energy. But as fatigue sets in, a fatigue which as I have shown reason to believe primarily results in or consists in a raised resistance at the synapses on the efferent path, the concentration of energy fails and begins to be supplanted by an increasing diffusion of

energy; the innervation, instead of remaining concentrated in the one set of efferent paths leading to the muscles directly concerned in effecting the movement, spreads to adjacent muscles and spreads more and more widely until a large part of the whole skeletal muscular system is brought into play at each effort. Does not this phenomenon imply an increasing overflow of energy from the primary efferent channels, as their outlets become increasingly blocked by fatigue, just such a flow of energy from one system of neurones to another as is postulated as a fundamental process of the nervous system¹ by the drainage hypothesis? In such a case we seem to have a process of energy flow which in its more central phase is one of concentration, followed in the later efferent phase by dispersal or spread.

¹The process which I proposed to denote as 'the vicarious usage of nervous energy.'

INTELLIGENCE IN MAN AND APE

BY HORACE G. WYATT

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There have been many definitions of intelligence and so far little agreement. Amongst these is that conception of intelligence or insight abundantly exemplified by Köhler in the interesting behavior of his chimpanzees when faced by the problem of discovering a way to their bananas, to which the direct way had been barred, so that it was necessary to make concerted movements of themselves or of things in their neighborhood in order to effect their object. For the purpose of this brief paper, it is assumed that Köhler's book is familiar, so that all that is necessary is to recall certain dominant characteristics of the apes' behavior relevant to the purpose of the paper. Köhler's records repeatedly illustrate the following distinguishable stages in the apes' procedure:

- (1) Attempts to reach the bananas directly. These failing,
- (2) A stage, more or less prolonged, of partly inconsequent and unconcerted efforts, often accompanied by outward expressions of what in human beings would indicate such emotions as anger, distress, weariness, and the abandonment of hope.
- (3) A moment or brief pause of apparent contemplation, or of increased attention and stayed activity.
- (4) A sometimes sudden change to a successful performance, which bears the marks of continuous and coördinated action, in which the items are of a kind and sequence conforming to the requirements of the performance as a whole, and not determined by frequency or recency or any particular serial position of the animal's previous movements. The learning, the achievement, is signaled by a reconstruction of the situation, not by any stringing together of previous isolated items, and it is the act of reconstruction, or rather the mental processes

conditioning that act, to which is attributed intelligence or insight.

The *Gestalt* psychology, of which Köhler is an exponent, represents the act of insight or intelligence as configurative, a configuration being in the words of Koffka "a coexistence of phenomena in which each member carries every other, and in which each member possesses its peculiarity only by virtue of and in connection with all the others." Applied to a learned achievement it may be expressed as a performance whole, in which each part of the performance takes its place and its character from the whole. The mental process which accompanies or precedes this new performance is represented as one of dawning insight or intelligence.

On this account of the matter the following questions straightway beset us:

(1) Is this metaphor of a configuration, structure, shape, an appropriate metaphor? Does it enlighten us as to the nature of intelligence or does it mislead us?

(2) Assuming it is correct as far as it goes, does it go far enough? Does it in any way *explain* intelligence, or is it merely a restatement of the inexplicable? To be told that a configuration occurs, for example, is not to enlighten us as to how or why it occurs, or why *this* configuration and not another; or whether it is a thing that is *sui generis* or can be resolved into other categories with which we are already familiar. Hence the further questions:

(3) Can we analyze the configurative process more in detail?—and

(4) Can we resolve it into more familiar psychological concepts?

To seek a reply to these questions we will turn to the field of human learning, for whereas the apes cannot tell us what goes on in their minds when they configure, the human being, at any rate to some extent, can.

There is no real need to undertake special experiments for the purpose, as anyone of ordinary intelligence can carry them out in his own person. But as it is convenient to have a common center of reference, two well-known sets of experi-

ments of which the records are easily accessible can be used for our purpose. One of these experiments considered the processes involved in solving a number of mechanical puzzles, and was reported by H. A. Ruger in his article called 'The Psychology of Efficiency.'¹ The other considered the higher mental processes at work in discovering and applying the rules which ensured success in playing some specially devised game with matches or beads, and was reported by J. C. Peterson.² In this bead game two players had a number of beads to draw from, and drew from them in turn, but were limited to a choice of numbers at each draw. You won the game if you compelled your opponent to make the last draw. The psychological interest lay in detecting the processes and stages by which the player worked his way to a solution of his problem of so determining what number to draw as to compel his opponent to draw last, and thus to the formulation of a set of principles of successful play. The most important concept involved was that of the critical number, the number or numbers by leaving which for your opponent to draw from you could ensure success.

A scrutiny of the records of these two experiments suggests the following comments on the act or process of insight or intelligence:

(1) The moment or act of insight can sometimes, but only sometimes, be described as a sudden flash; it is as often a succession of glimmering apprehensions, and is found present in all degrees from elusive and indefinite dimness to a clear and convincing definiteness. This insight, it should be noted in passing, is irrespective of any imagery that may accompany it, being a definitely distinguishable experience. The point I would make here, however, is that in this shaping or configuring process it is not so much the shape or figure that impresses one as the coming of the shape into being. If we would understand the nature of intelligence, it is the process or becoming as well as the act or consummation that deserves our attention.

¹ *Arch. Psychol.*, June 1910, 2, (no. 15), pp. 1-88.

² *Psychol. Monog.*, 1920, 28, (no. 7), pp. 1-121.

(2) At the same time there is a definite transition from one to another way of cognizing the situation, whether we regard the transition as sudden or gradual. There is an introduction of something new, and there must be a 'before' and 'after' that introduction. There is at any rate a break or step or shift—a mental event or act. And in so far as it involves a new view of old matter the metaphor of configuration can be accepted. But as a representation of the operation of intelligence the metaphor is inadequate and misleading, because

(3) It is not in the shaping or configuring but in the way in which configuration is effected that intelligence resides; there may be intelligent and there may be unintelligent configuration. *Intelligence does not reside in configuration as such.* The metaphor consequently misses the point.

(4) The intelligent process could be more adequately described as the act of effecting true relations, or of discovering or disclosing or becoming aware of the relations between elements presented to the mind that are relevant to the purpose in view. It is not the shaping but the *shaping-according-to-purpose* that constitutes the insight. That purpose may be the discovery of truth as such or it may be some immediate practical end.

(5) In the functioning of intelligence there are two terms, neither of which may be overlooked if we are to understand what takes place. One of them is the living organism, the other is the environment. Every act of intelligence is the effecting of a real or true relation between these two, so that intelligence can never be adequately defined in purely subjective terms. It operates at the point where mind and matter meet; it is in fact the bringing of the two together. The act of conforming the subject to the object, or of the object to the subject, is intelligence.

(6) Intelligence is thus capable of degrees. *A* is more intelligent than *B* according as he is superior in effecting relations, in particular as he discovers relations more accurately or truly, and more comprehensive relations, than *B* does.

Briefly to support the first four of these contentions from

the two experiments referred to. To cite Peterson: His players' progress in learning the games, that is in seizing and holding the relations and sets of relations and relational systems which, governing practice, ensured success, exhibited "regular and more or less gradual changes, due in part to the separate mastery of numerous relatively isolated though often poorly defined elements of the problem situation, in part to the gradual definition and development of larger and more complex units in the form of concepts and general principles." Again "the discovery of a critical number was not usually a sudden event, but a gradual process of isolation and growth of meaning." 'Sudden comprehensive insight' was rare. Usually there were fleeting insights, which "with continued repetition of the situations acquired stability and depth, until finally it became possible to formulate their relations into satisfactory principles of control."

The picture left with the reader by the reports of Peterson and his subjects is that of minds fumbling after useful concepts, trying to seize significant relations, catching, and again losing sight of possibly significant elements in the situation, securing or abandoning them on repetition, and as this or that useful concept is caught and held, passing through a similar process of increasing mastery of the more comprehensive concepts of the relations between the elements already secured. In fact the process is one of gradually constructing, or disclosing, a complex relational system.

To turn to Ruger's subjects trying to solve their mechanical puzzles. As regards their appropriation of significant elements, or as Ruger puts it, 'the explicitness of their analysis' there was 'a wide range of felt clearness from extremely vague to perfectly clear.' His subjects exemplify the same phases of dimness and doubt. "I suspected rather than saw that this was the path of solution" is the type of introspective comment that is common. But on the other hand there are many illustrations of sudden insight. "The process of analysis," says Ruger, "of 'seeing through a thing' is a very distinct experience. In many cases it came as an extremely sudden transformation, a flash experience." He

speaks of 'the rush of the new impulse,' and 'the flash of cognition of its meaning.' His experiment took place in 1910, but we find him unwittingly using the language of *Gestalt*. Speaking of perceptual analysis he notes that "the kinds of analysis within the perceptual field differ in value. . . . Perceptual analysis is not plastering an image on to a percept, but a direct transformation within the perceptual field itself." This is just the language in which Köhler describes the experiences of his apes. They are said to reconstruct the visible field. The configuration and the transformation are curiously akin. But there is no need to quote from other people's experiences. Everybody uses at times such statements as, "It suddenly struck me," or "Ah, I see, that's the way to do it," or "Now I understand what you mean," or "I grasped the principle at last." Each of these utterances describes a becoming aware of a set or system of relations of which we were not aware before, a new view of the matter before us, in which in each case the individual mind has contributed something new. It has been active—it has done its bit. This contribution, or this act of contributing we may provisionally call the moment or act of intelligence, but only provisionally, for reasons to be stated immediately.

For now arises the question whether the configuration metaphor aptly or inadequately expresses the cardinal facts about the process of intelligence. To this we may at once venture the answer *No*, for a simple reason. *It does not help us to distinguish between insight and illusion.* It is not the act of reshaping a situation that constitutes intelligence, for we are reshaping situations continually. Configuration is not necessarily insight, for the particular configuration may be right or wrong—it would appear to be insight only if it happens to be right, to be the patterning or structuring that fits the situation. We may have a number of hypotheses about a given matter, but only one of them is the right one; and the situation as presented does not commit us beforehand to any one of them; the situation that is to say does not determine our reshaping of it. We do the shaping ourselves. And we may reshape or reconstruct ideationally or perceptu-

ally well or ill, just as, and just as intelligently or unintelligently as we may reshape our lives as a whole, or our conduct on any occasion. Hence the configuration metaphor is inadequate for our purpose—it throws only a half light on the nature of intelligence. Peterson's and Ruger's subjects were constantly reshaping their situations, entertaining new hypotheses, and a great many of them did not work. They had reconstructed wrongly.

If it be answered that by configuration is meant reshaping in accordance with the needs of the situation, we may admit the emendation, but then we seem justified in claiming that the metaphor is at least an unfortunate one, in that it suggests a wrong emphasis, in fact that it has 'misconfigured' itself. It has the wrong shape, a quite misleading one.

This does not mean that the configuration concept is to be abandoned from psychology. On the contrary it is serving a very useful purpose, because it is bringing into relief a characteristic of mental and intelligent process that has been persistently overlooked, namely that configuration or transformation, whatever the name we choose for it, is a fact, and that the process cannot be accurately represented as a mere association of what has been previously experienced. We may indeed be grateful to the Configuration school for having corrected our picture of the process that has to be explained, for *having restated the problem more correctly*. By so doing they have placed us in a better position for attempting its solution.

It is now time to approach the crucial question. Where in the process of transformation, of configuration, in forming new concepts, in framing fresh hypotheses, in reshaping the situation, does intelligence come in? When is the process one of insight, and when is it not? Keeping clear of all metaphysical dogmas and considering only the psychology of the matter, the following appears to be the answer. Insight is exhibited according as the particular set of relations, or system of relations, the hypothesis or concept that comes into consciousness, is the set required for the particular purpose entertained by us. Intelligence is always relative to purpose,

to a purpose subjectively entertained, though it may not be completely conscious. Apart from the influence of purpose, Köhler's apes could have configured the situation in a hundred, or at least an indefinite number of ways; they were surrounded by various objects, capable of any number of permutations and combinations and rearrangements. And many of their movements of them appeared to be random or purposeless. But when there appeared a certain combination of movements, so disposed and connected and interrelated as to effect the particular purpose of obtaining the bananas, then Köhler claimed that the animal displayed insight. The animal had grasped the particular set of relations out of innumerable possible sets or arrangements, which, observed in practice, brought him and the object of his desire together. It was not the pattern or shape that did the trick, but the patterning according to purpose, the relating of the relatable to the main end in view. From which we may surmise that the configuration school would represent the facts of intelligent activity more adequately if they changed the word configuration or shape to the more pregnant word 'design.' There is not only a pattern, but also a patterner. But that perhaps is asking too much at present.

The conclusion we reach so far then is that insight or intelligence (though the two words are not quite synonymous) is not essentially so much configuration as the relating of means to ends, or the discovery of elements in a situation and the relating of them to one another in a whole itself related to the end in view. The phrase 'in view' must be construed to include awareness of different degrees or levels, from the impulse of the animal towards its objective to the self-conscious purpose of the human being on the ideational plane.

The *Gestalt* school, or at least one branch of the school, represents the configuration as the *ultimate structural unit of mind*. To this we may rejoin that a more illuminating conception is that of this relating power as *an ultimate functional unit of mental activity*, a faculty or specific mental capacity, distinguishable from sensation, memory, volition, or any psychological category, a faculty (and I use the term ad-

visedly) which requires recognition on its own merits. Further, until we recognize and begin to explore the operations of this unique characteristic of mind, psychology will remain inadequately configured, for it is round this activity, and as serving its development, that sensation, perception, memory, and cognitional functions in general, possess their character and their warrant. This faculty is not to be *explained*, in the sense of resolving it into something more simple or familiar, any more than we can explain consciousness or color or motion by resolving them into any other terms—we do not explain colour for instance by discoursing on wave lengths, etc.—intelligence is susceptible not of explanation, but of *understanding*. We may be said to attain to understanding of it in proportion as we make progress in exploiting its operations and in exploring its conditions and settings and the different levels at which it acts. We might begin with familiarizing ourselves with the concept, and this not by elaborate experiments in a specially constructed laboratory, but by detecting the workings of intelligence in our ordinary daily life. For as the snail carries its shell, so psychology has the great advantage over other sciences that every student of psychology carries his laboratory with him, and can watch his subjects work under much more natural conditions than is possible in any costly laboratory, devised for the purpose.

To restate the main contentions of this paper by way of summary:

(1) The progress of theoretical psychology is checked by a reluctance to acknowledge the distinctive character of the act or process of intelligence.

(2) The *Gestalt* view of insight or intelligence correctly exhibits intelligent activity or the act or process of thinking as a shaping, structuring or patterning of a presented situation; but

(3) Provides no criterion for determining whether the particular structure or pattern achieved is the right or the wrong one; that is, does not distinguish between insight and illusion.

(4) Configuration is insight only where it is right, that is,

is a configuration fulfilling the felt purpose or the (more or less consciously) desired end. Thus—

(5) As it is not the shaping, but the shaping according to purpose or impulse that constitutes insight, the intelligent activity may be more adequately represented as design (in its double meaning) than as configuration; and

(6) Consists rather in apprehension or discovery of real and serviceable relations between objects before the mind than of shaping or patterning as such.

(7) Intelligence, as a personal quality, is capacity for insight (in the sense given), which is an ultimate mental element in the sense that like consciousness it cannot be resolved into anything simpler. Our business as psychologists is not to explain it, but to explore its workings.

In the summary just given, I have used the word thinking in the second paragraph both narrowly and widely; narrowly, in that it is restricted to the mental activity involved in solving a problem, practical or ideational, or acquiring *new* skill or knowledge, widely, in that its operation is implied below the human, and below the clearly conscious, level. The question of the nature and validity of motor intelligence is left open. In paragraph 6 I have deliberately preferred the rather vague phrase 'before the mind' to such a phrase as 'present in consciousness' so as to leave open the question as to the degree of consciousness necessary for effective, that is intelligent, configuration.

THE TEACHING OF PSYCHOLOGY IN TEACHER- TRAINING INSTITUTIONS OF THE SOUTH¹

BY JOSEPH PETERSON AND GLADYS DUNKLE

George Peabody College for Teachers

This study is an attempt to determine the degree of efficiency of instruction in psychology in Southern teacher-training institutions and departments. Practical demands on our time made it desirable to limit the field of investigation. Letters and questionnaires, signed by President Payne,² George Peabody College for Teachers, and one of the writers (Peterson), were mailed to the presidents of state normal schools and of state teachers colleges, and to deans of state universities in Alabama, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, South Carolina, Tennessee, Virginia, and West Virginia,³ explaining the object of the investigation and asking for the coöperation of these officials. With a few exceptions these were mailed about November 18, 1925. Copies of these letters and questionnaires are here reproduced in full.

NASHVILLE, TENNESSEE,
November 18, 1925.

President (or Dean),

.....,

.....,

Dear President (or Dean)

George Peabody College for Teachers is attempting to determine the equipment of teacher-training institutions of the South for giving training and instruction in psychology and educational psychology. Your coöperation will be appreciated. Will you kindly

¹ Read by Mr. Peterson in the meeting of the Southern Society for Philosophy and Psychology, Lexington, Kentucky, April 2, 1926.

² He is president of the Southern Association of Teacher-Training Institutions.

³ The names and addresses were taken from the *Educational Directory*, 1925. By an error on the part of the secretary Arkansas, Missouri, and Texas were omitted.

hand to each of your teachers of these subjects (whether part-time or whole-time teachers) one of the enclosed questionnaires entitled 'Qualifications of Instructors in Psychology,' and to the chief teacher of psychology, or to the head of the department, the additional questionnaire on 'Laboratory and Library Equipment,' with the request that each instructor fill out the blanks as promptly and as accurately as possible and return the sheets to you?

When the sheets have all been returned to you, please mail them to us in the enclosed self-addressed envelope. All data will be treated as confidential and the names of institutions will not be mentioned in an uncomplimentary way. Our purpose is to study the general situation, not any particular institution.

If you are interested in the results please indicate it by checking here () and returning this sheet with the other data, and we shall be pleased to send you a copy of the report when it appears in print. If there is any error in your name or address, kindly make the necessary corrections.

Thanking you in advance for your assistance, we are

Yours gratefully,

(Signed) BRUCE R. PAYNE,

President,

(Signed) JOSEPH PETERSON,

Professor of Psychology.

Qualifications of Instructors in Psychology

(To be filled in by the instructor in psychology. 'Psychology' as used here means both psychology and educational psychology.)

Name of school

Location

Name of instructor

Position (State whether head of the department, full-time, or part-time teacher of psychology).

How long have you taught psychology?

In what field did you work before accepting your present position?

To what educational, literary, and scientific organizations do you belong?

Have you ever had a scholarship, fellowship, teaching fellowship?
Where? When?

How do you usually spend your summers?

a Teaching in your own institution?

b Teaching in a different institution?

c Attending a higher institution?

d Research? *e* Travel?

Remarks:

How long have you taught in your present position?

What courses do you teach in psychology?

List all those who teach psychology in your institution.⁴

Degrees you hold	Institution granting degree	When granted	Major field	Minor field	Second Minor

Please give the names of your major professors when you were a graduate student.

Please give the names of your minor professors.

Course	Instructor	Year	Hours per week	Quarters	Half- years
General Psychology.....					
Advanced General Psychology...					
Child Psychology.....					
Adolescent Psychology.....					
Educational Psychology.....					
Advanced Educational Psychol- ogy.....					
Psychology of Secondary Edu- cation.....					
Psychology of Primary Education.					
Abnormal Psychology.....					
Genetic Psychology.....					
Psychology of the Maladjusted Child.....					
Physiological Psychology.....					
Experimental Psychology.....					
Psychology of Learning.....					
Comparative Psychology.....					
Animal Behavior.....					
Psychological Clinic.....					
Social Psychology.....					
Psychology of Perception.....					
Psychology of Advertising.....					
Psychological Basis of Music....					
Psychophysics.....					
Psychiatry.....					
History of Psychology.....					
Special problems or investigations.					
a Experimental.....					
b Non-experimental.....					
(List the problems investigated)..					
Other courses not listed above...					

⁴ Sufficient space was left at the end of each question or part of a question for the answer or a check mark indicating the answer.

How many courses have you had in each of the following: Biology, physiology, neurology, eugenics, philosophy, ethics, logic, physics, chemistry, education, sociology, statistics, German, French?

What have you contributed to psychology or education in the way of publications?

Courses you have had in psychology. (For each course fill out one of the last two columns as to length of period. You may have had some courses in institutions which have the quarter system and some in institutions having the semester system.)

Laboratory and Library Equipment for Teaching Psychology

1. Amount of funds available each year for laboratory equipment.
2. Amount of funds available annually for psychology books; for journals.
3. How are these funds secured? (Give amounts from each source.)
 - a State appropriation.
 - b Paid by students who are taking psychology (i.e., fees).
 - c Other sources.
4. What apparatus do you have? (List the most important pieces.)
5. What materials do you have in the Physics Department, the Biology Department, etc. that may be used in the psychology laboratory?
6. How many rooms are available for psychology only?
7. How many rooms are available for psychology part-time?
8. Approximately how many books on psychology are in your library?
9. Give the names of the psychology journals available to students in the library or laboratory.
10. What uses do you make of test material? (List the studies, based on such materials, that you have made.)
11. Have you a plan for increasing the laboratory equipment? If so, what is it?
12. Have you a plan for building up a laboratory in case you do not have one? What is it?

Sixty-one letters were sent out and twenty-two institutions replied, giving data on thirty-seven instructors; that is,

thirty-six per cent of the institutions responded. Most replies attempted honestly and frankly to give the information sought, and we here wish to thank those who thus willingly gave of their time. There were only a few evasions and excuses made. Some instructors even promised to give further details if desired. How well those schools replying compare with those not replying, and are representative of all, can only be conjectured. It is but natural to suppose that, with a few exceptions, the institutions replying represent a superior sampling. It is, however, best to study only the data obtained, and to report our results from these as accurately as possible.

Only five presidents returned our letter with a check mark to indicate a desire to receive a copy of our report! One president, in addition to these, expressed great interest in our study, acknowledged a lack of equipment in his institution other than a good supply of reference reading in the library, and stated that it was impossible to 'make a contribution' to our investigation. A realization of the need of material for psychology teaching was expressed as well as an eagerness to know about our findings. Though the letterhead bore the printed statement that "——— is now a standard four year teachers' college. Standard academic degree is also conferred," no returns from instructors as to their qualifications were received by us. Blanks from twenty institutions gave most of the information called for in the questionnaire. These institutions are appropriately divided into three classes as follows: Group I, consisting of two academic colleges (one for women) giving in their curricula courses for the training of teachers, and two state universities; Group II, comprising eight normal schools and three teachers colleges for whites; and Group III, including two normal schools and three colleges (one a 'collegiate institute') for colored students. The distinction between normal schools and teachers colleges is often not well marked in fact, as large percentages of students in the 'colleges' are frequently not of college grade and the enrollment in the junior and senior years may be comparatively small. This is due in part to the fact that many

of the teachers colleges have but recently been changed from normal schools to colleges granting the baccalaureate degree. Table I gives a summary of the data on institutions, divided into the three groups just defined.

TABLE I
STATUS OF INSTITUTIONS

	Group I 4 Institutions	Group II 11 Institutions	Group III 5 Institutions
1. Annual funds for laboratory	Range \$500 to \$2500 Median \$1000 Mean \$1000 M.V. \$ 667	0 to \$ 50 0 \$ 6 \$ 10	0 to \$100 0 \$ 25 \$ 38
2. Annual funds for books and journals	Range \$130 to \$ 300 Median \$ 250 Mean \$ 233	\$7 to \$270 \$ 80 \$100	\$25 to \$100 \$ 63 \$ 63
3. Source of funds.	All state appropriations, except that one institution also added laboratory fees.		
4. Apparatus.	All had some; one, considerable	All had none	Only one had any
5. Materials borrowed (charts, brain models, stop watches, etc.)	Two borrowed	Five borrowed	One borrowed
6, 7, and 8. No important information obtained. .			
9. Journals available.	2 to 29, mean over 10	0 to 6, mean 2.2	0 to 2, mean less than 1
10. Uses of test materials..	All, several uses	3, no use; 2, class demonstration; 3, several uses	One, no use; 3, class demonstration
11, 12. Plans for laboratory	3 had plans	None had plans	No definite plans by any

No satisfactory results were obtained from the parts of the questionnaire dealing with the number of psychology courses and of related courses which the several instructors had had. In the replies there were clear evidences of confusions as to courses, hours, length of courses, etc., some clearly giving the number of hours instead of courses, thus making any summaries and comparisons misleading. It was found, therefore, that teachers' training in psychology was most clearly revealed in the data on degrees having been conferred and on the major professors under whom the training had been obtained.

TABLE II
QUALIFICATIONS OF INSTRUCTORS⁵

	Group I (12 Instructors)	Group II (18 Instructors)	Group III (7 Instructors)
1. Head of department or full time instructors.....	75 per cent (9)	17 per cent (3)	100 per cent (7)
Part time instructors.....	25 per cent (3)	72 per cent (13)	0 per cent (0)
2. Years taught, Mean.....	8	4	9
M.V.....	3.7	2.9	2.8
3. Years in present position.....	5	3	7
Mean.....	4.3	1.7	4.0
4. Previous field....	Educ., 5; Ministry, 1; Psychol., 5	Educ., 13; Educ. Psychol., 1	Educ., 7
5. Membership in associations.....	Educ., 9; Psychol., 4	Educ., 15; Psychol., 1	Educ., 7
6. Have had scholarships or fellowships.....	10	7	1
7. Teach in summer. Study.....	11	16	5
Do research work.	2	4	2
8. Highest degree...	2	1	0
	Ph.D., 8; M.A., 3; B.S. or B.A., 1	Ph.D., 1; M.A., 15; B.S. or B.A., 2	Ph.D., 1; M.A., 3; B.S. or B.A., 2
9. Major in psychol. Other lines..	7	7	2
	5	9	3
10. No. contributions to psychology....	57	1	0

Unfortunately the questionnaire did not discriminate between high school and college courses in asking for a list of related courses taken, so we are limited in the conclusions that can be drawn from the replies on this point; but the data showed that as a general rule the instructors in all three groups had at some time or other had considerable contact with the basic sciences, both biological and physical. Nothing can be determined, however, as to the nature of this contact, *i.e.*, as to whether it was a mere reading and talking about science, or actual scientific work. It is very essential that teachers of

⁵In certain cases above the numbers do not agree with the totals at the head of the column. Such discrepancies are due either to the omission of some instructors because of lack of data necessary for classification or to the enumeration of certain instructors under more than one head.

psychology learn to use scientific methods and scientific apparatus. The memorizing of so-called facts is certainly of minor importance. Indeed, we may say that it is of comparatively very little value, and that such methods carried into psychological teaching would tend to hinder rather than further the progress of the science and the efficiency of the students thus taught.

It will be recalled that our Group II, including eleven institutions and eighteen instructors, consisted of eight normal schools and three teachers colleges. Have we possibly done an injustice to this group with so large a majority of normal schools by putting these two kinds of institutions together? This question cannot be fully answered from our data, but a separate table of this group, comparing the normal schools with the teachers colleges, reveals no noticeable or reliable difference between these two classes of institution either as to laboratory and library equipment or as to the training of instructors. Indeed, the normal schools are actually a little superior, but the difference is not reliable. Evidently better qualified instructors were not brought in with the changes of some of these institutions to full collegiate rank.

These, then are the bare facts obtained. We have presented them so that every reader can study them and come to his own conclusions, and anything further that we may say of them here is secondary to the data themselves. Let us, however, add our own conclusions from them, since we have carefully considered all the individual returns from which the tables are compiled. In the first place we must warn the reader against hasty conclusions. We realize that our data, due to a lack of coöperation which may be justified in some instances, are based on so few cases as to warrant only tentative conclusions. Group I had the advantage of including one of the best and most progressive state universities in the South, but this would not affect medians. Ranges have been included to give an idea of the best conditions as well as of the poorest. A comparison of the central tendencies shows that the institutions in Group I are rather distinct from the other groups. We are forced to the conclusion that the

normal schools and teachers colleges have no adequate conception of psychology as a growing science and of the needs of institutions and the qualification of instructors for proper training of students in this line. In the regular colleges and universities there is distinct evidence of a recognition that psychology is a science and must have laboratories, journals to keep the department in contact with other laboratories, instructors who themselves are adequately trained and who are contributing to the growth of the science, and opportunities for research. The normal schools and teachers colleges, on the other hand, show no appreciation of this fact. Most of them, even of those of collegiate rank, have no laboratory equipment and no funds for any, no journals, few real psychology books, and no plans to improve in these regards. The majority of them do not even have teachers for psychology who have been trained in psychology even as far as to the requirements of the master's degree. Indeed, the majority have not even done their major work in psychology, and evidently have no professional standards as to teaching in lines outside the range of their preparation. They teach psychology because they are offered a position in this line, and the offer comes from persons who, though entrusted by the state with great educational responsibility, do not themselves know that these instructors cannot possibly train students in psychology and educational psychology. While it is obvious that presidents of normal schools and of teachers colleges cannot be expected to be experts in all lines, the public has a right to demand that they employ specialists to do work that only specialists can do and that they leave to these individuals the main responsibility for developing their several lines of work and acquiring facilities for keeping in touch with progress in other laboratories and leading centers of activity. We are aware that you cannot expect too much from institutions with limited funds, but you may rightfully expect that they will move in the right direction and that they will secure advice and aid from competent persons and initiate plans, and campaigns if need be, for at least moderate improvement along the lines of their needs. The fact seems to be that most educators have no adequate conception nowadays of

what psychology is and of the scientific methods which it employs, methods of gathering data and testing their reliability, in which unprepared teachers cannot adequately train the students entrusted to them. They do not know that learning the names of different real or imagined mental functions, instincts, emotions, of kinds of 'will,' methods of reasoning, 'laws' of association and of learning, etc. is no more being trained in psychology than learning the names of plants is studying botany. How can an instructor teach psychology if he knows nothing of the live problems in the science, has used none of the important methods being employed in various centers of research, and is ignorant of the difficulties in the way of the various hypotheses and theories that are so over-simplified in the texts? How can he be a reliable guide to students studying psychology if he does not know how to test the accuracy of assertions made in books about instincts, emotions, the functions of imagery of different kinds, the innateness of this and that aptitude, if he cannot determine effects of different conditions on learning and memory, measure individual differences in intelligence and in various mental traits and find the validity and the reliability of these measures, make and use simple regression equations for predicting one kind of performance when a related one has been evaluated, compare groups in a quantitative way and find the statistical reliability of any differences obtained, etc.? How can he teach psychology if he cannot devise means and set up apparatus to test out various hypotheses as to modes of neural functioning or the operations of elementary mental processes in learning, in perception, and in abnormal reactions; if he does not know the devices, experimental or statistical, for holding constant certain factors while results of others are being studied, for controlling fatigue and practice effects, for expressing quantitatively and evaluating the judgments of different individuals as to the relative merits of different efforts like painting pictures, writing descriptions, or what not? If education is not to become a mere indoctrination process, as many are supposing it to be and hence are working for the perpetuation of their own doctrines through the schools, our teachers must be equipped to train the youth of our country

in scientific methods of sifting out the truth about human conduct as well as about the so-called physical world. If scientific methods can become properly stressed in our schools, instead of the mere repetition of half-truths, there will be less clamoring by different interests for the introduction into the curriculum of their several dogmas,—and it will make little difference if they are introduced. Surely this work of training teachers in the sifting and evaluation of facts about human behavior is fundamentally the work of psychology, and the responsibility of instructors in this science. If text-book writers would emphasize the technique of scientific *methods* with unnecessary complications, rather than the mere reproduction of printed statements many of which are either wrong or of no importance, it would be impossible for improperly trained teachers in normal schools and teachers colleges to assume the work of psychologists. Many of them now find it necessary to go back a couple of decades for books suitable to their methods and understanding.

It may be argued that 'educational psychology' is what is wanted in these institutions and that this can be taught by teachers trained in education and without laboratories; it may be urged that much of the content of psychology is of little aid to teachers. In reply we ask: *Why* does the teacher, who is to spend his entire time at modifying and improving behavior need less of general psychology, physiological psychology, social psychology, experimental psychology, abnormal psychology, etc. than the students in arts schools, engineering schools, law schools, business schools, etc.? That the teacher needs special courses for certain specific purposes no one can deny, but how can he profit by these courses if they are taken without the foundation courses? He probably needs the usual foundation courses and, in addition, certain special courses. Of course, the general student cannot take a great number of these foundation psychology courses, but how can the future teachers of psychology, and of education, get along without having an unusually good grounding in them? Surely the answer to this problem is not for teacher-training institutions to turn away from psychology and to employ teachers trained in other lines to teach what they

prefer to call psychology. If they do this, what recognition shall be given to such work by graduate schools? The problem that is not quite clear to us is: Why should teacher-training colleges not have as good psychology departments as do other colleges? As for distinctions between educational psychology and psychology, no real difference that does not make educational psychology mere education is very obvious, except that additional special courses may be called educational psychology. Certainly they cannot flourish well in the isolation from productive work in psychology that we find in representative teachers colleges in the section covered in this investigation.⁶

⁶This paper stimulated prolonged discussion in the meeting of the Southern Society for Philosophy and Psychology, the general sentiment being that it raised important questions which merited further investigation under the auspices of, and action by, the Society. The opinion was expressed by psychologists from Northern states, present at the meeting, that the deplorable conditions brought out were not peculiar to the South. The following resolution, for a copy of which we are indebted to Dr. James A. Highsmith, Secretary-Treasurer of the Society, was adopted by the Society in its business meeting on April 3:

"Whereas a study of the teaching of psychology in colleges, state teachers colleges and normal schools reveals that psychology is taught in a number of institutions by teachers whose training has been inadequate; and whereas the equipment of laboratories, technical periodicals, etc., necessary for proper training in psychology has also been found to be inadequate, (conditions which probably do not obtain in the South alone); therefore, be it resolved that:

1. The Southern Society for Philosophy and Psychology hereby appoints a special committee with power to carry out these resolutions, consisting of Professor Joseph Peterson, of George Peabody College for Teachers, as chairman, and Professor Buford Johnson, of the Johns Hopkins University, Professor J. B. Miner, of the University of Kentucky, Professor T. K. Sisk, of the State Normal School, Livingston, Alabama, and Professor J. W. Woodson, of the State Teachers College, San Marcos, Texas;
2. That the Society expresses its disapproval of the teaching of the first years' courses in psychology, educational psychology, and other branches of psychology, by anyone who has not had the training represented by at least a master's degree with major in psychology; and also the teaching of advanced courses in these subjects beyond the first year's courses by anyone who has not had at least the training equivalent to a doctor's degree with a major in psychology;
3. That the Society asks all heads of departments in which these subjects are taught, whenever the question of transfer of credit from other institutions to theirs is raised, to disapprove the transfer of any credits in these subjects not taught by persons qualified as indicated above;
4. That the Society asks the above Committee to cooperate with the various institutions and the associations of colleges in every way possible to raise their standards in accordance with the above resolutions; and
5. That the Society authorizes the Council to appropriate such sums as are necessary for carrying out the intentions of the above resolutions.

A SCHEMATIC CLASSIFICATION OF GENERAL PSYCHOLOGY ¹

BY CHRISTIAN A. RUCKMICK

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The elementary student is often bewildered by the presentation of technical names which are used to describe the various branches of elementary psychology. Frequently he can not easily distinguish between differences in points of view, methods of approach, and fields of activity. In a previously published article an attempt has been made to clarify the situation in regard to method.² The same motive has here prompted the writer to classify the subdivisions of psychology.

The chart opposite p. 398 shows the historical development of psychology into various branches on both the theoretical and experimental sides so that any given course of study can be traced by a sort of linear descent through the schema. Just as, for example, charts ordinarily help the student in obtaining clear and lasting impressions of the learning process, of the facts of visual sensation, or of the structure of any sensory organ, in the same way a chart representing the whole subject matter of psychology does much to orientate a student through a general course or through any given special course in the subject. In addition it has the useful function of drawing the student's attention not only to the multifarious activity of present-day psychologists but to the intimate relationships between workers in affiliated fields of investigation.

It is not claimed that this chart is without fault. Two obvious criticisms can be directed toward it: (1) any logical classification at once does damage to the objects classified in that it neglects gradations and intermediate positions, and

¹ Revised from a paper read in the Psychological Section of the Iowa Academy of Science, Cedar Rapids, April 30, 1926.

² Ruckmick, C. A., 'A Schema of Method,' *PSYCHOL. REV.*, 1914, 21, 393-401.

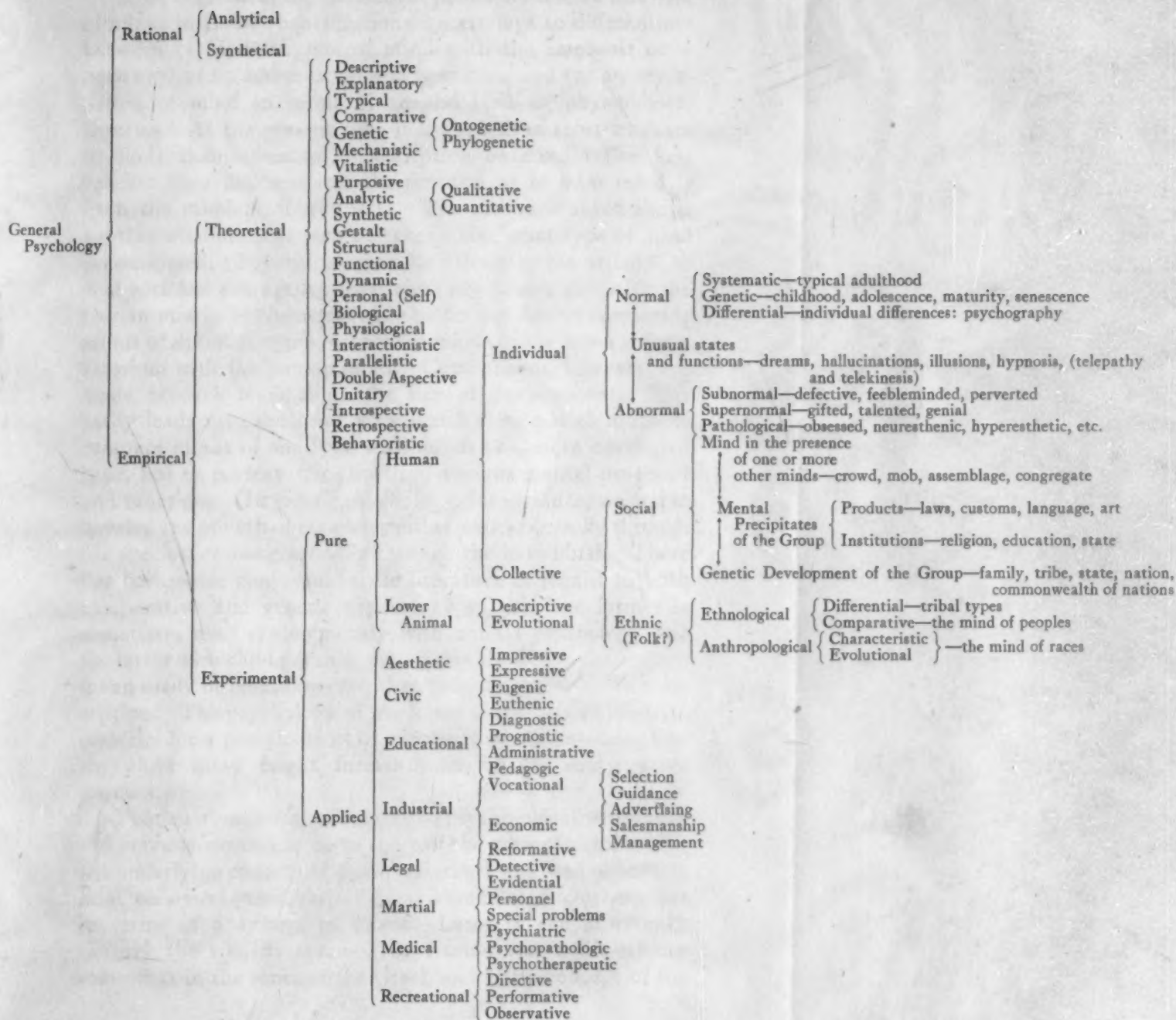
tears apart those items which in actual practice are inter-related and integrated; (2) since the chart is the logical product of one mind,³ it must be in a sense highly personal and unscientific. Another psychologist attacking the same problem might make a radically different schema. It is for this reason that the chart is presented for publication. The classification, of course, must also be subject to expansion and development as positive knowledge accumulates.

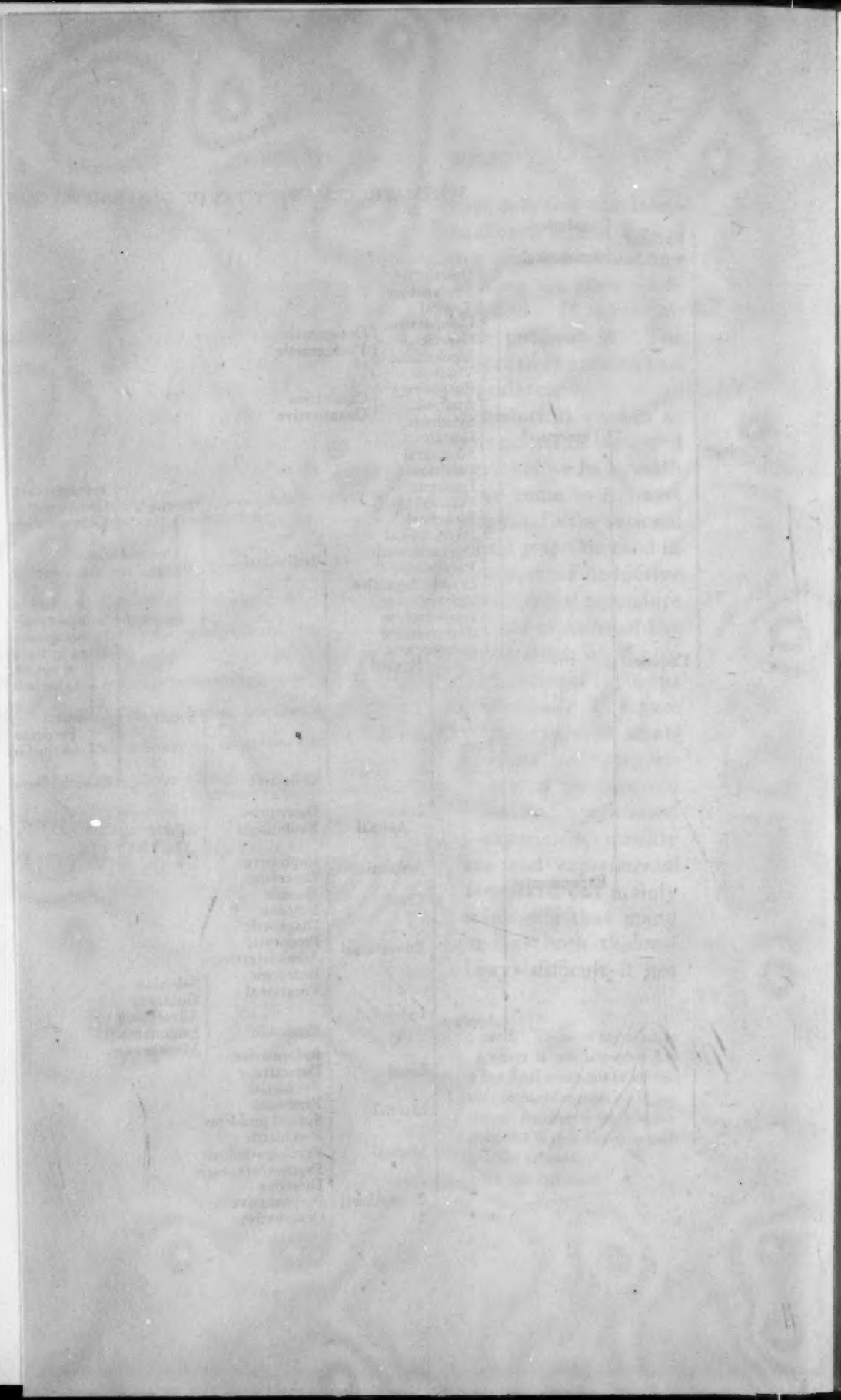
This schema attempts to show the historical growth of psychology as well as most of the different points of view and the subdivisions of present day psychology. If we begin with the generic term of *general psychology*⁴ we come to the first division of *rational* and *empirical* psychology. In the rational point of view the chief emphasis was on the *a priori* method in which concepts were produced by the process of deductive reasoning from previous concepts. This is a typical procedure of the so-called 'arm-chair psychologists' and of most of the treatises written before the eighteenth century when Wolff proposed to differentiate the two types. The rational type was divided into two classes: *analytical* and *synthetical*. These are minor differentiations in which the former term expresses an attempt at reflective analysis, whereas the second involves putting these concepts together synthetically into a structure of a typical human mind. The empirical division, which was based upon evidence obtained directly from experience, quickly divided itself into *theoretical* approaches and *experimental* investigations. Inasmuch as the chart is worked out mainly on a logical basis it may be said in parenthesis that many professional psychologists were considered as both theoretical and experimental. In fact it is always difficult if not impossible to be one without the other.

³ It is indeed difficult to trace the history of the chart itself. Those of my readers who have devised similar charts may realize that such a chart is not invented but composed. The writer does not claim credit for anything but final synthesis of all the items, nor does he seek to unload responsibility for the chart or parts thereof on other psychologists. He can trace a small sector of it to Professor Bentley who in some early lectures on General Psychology made a preliminary excursus in this direction and hence gave the writer the idea of expanding and elaborating the schema.

⁴ All terms appearing in the schema, or their equivalents, are italicized.

SCHEMATIC CLASSIFICATION OF GENERAL PSYCHOLOGY





If we begin with the theoretical points of view we find first of all, as in Ladd's contributions, an attempt to differentiate between (1) a *description* of mind with the emphasis on a portrayal of its composition and operation and (2) an *explanation* of mind in terms of general laws or physiological theories. At the present time it is the aim of most treatises to limit themselves to a description of mind. The first bracket then differentiates the problem as to *what* mind is from the problem of *why* it is. The second bracket shows another attitude that may be taken: *viz.*, what type of mind is considered. Psychology may be written in the attempt to deal with the average *typical* normal mind especially with the human mind; or the stress may be on the side of *comparing* minds of different types, especially minds of the lower animal kingdom with the human mind. Comparisons, however, are made at each level along the line of development. This easily leads into the third view which aims not so much to compare minds of one type with minds of a more developed type, but to portray the growth of various mental processes and functions. In *genetic* psychology, for instance, we try to develop the growth of reasoning either *philogenetically* through the species, or *ontogenetically* through the individual. There has been some confusion in the literature in regard to both comparative and genetic psychology so that the former is sometimes used synonymously with animal psychology and the latter with child psychology. From the above description it can easily be seen, however, that there should be no misconception. The psychology of the lower animals might furnish material for a genetic point of view just as the psychology of the child mind might furnish material for comparative psychology.

The next bracket applies more to psychological writings of the previous century than to those of the present. It stresses the underlying concept of mind. Herbart was fond of putting mind on a *mechanical* basis. Ideas were related to other ideas in terms of a system of forces. Later in the nineteenth century the *vitalists* assumed that mind was a life-essence somewhat in the sense of the Greek and Latin concept of the

'breath of life' as shown in the writings of Aristotle, and even later in those of Thomas Aquinas. The *purposeful* type of psychology lives today to some extent in the works of McDougall and others. In this case, mind is described as having a purpose of its own much like the intentional psychology of the 'act' school exemplified by Lipps and Stumpf. We still have an *analytical* psychology as well as a *synthetic* psychology at the present time, when we consider the writings of Stout under the former head, and some of the papers of Bentley and others under the latter head. So the next group shows what logical attitude may be taken by way of description of mind. In a certain sense, of course, all experimental work is done from the analytical point of view and all systematic writings based upon experiments must finally be put together under the synthetic point of view. Then, we may ask, what is to be the *unit* of analysis? Analysis may proceed chiefly along *qualitative* lines, attempting to reduce mental processes and functions to lowest terms on the basis of their *nature*, or along *quantitative* lines of *degree* by means of which these same processes are measured in approved units. Analogous to these points of view is that of *Gestalt* which has placed special emphasis upon the configuration of mind on the level of immediate experience as the point of departure. In other words, as mind appears to the experiencing individual it is something more than the summation of the parts into which it has been scientifically analyzed. It has a pattern or arrangement which is the ultimate unit.

Our next brace attempts to delimit further the concept of the unit of description and includes the concepts of *structure*, first advanced in crystallized form by Titchener but now more or less worn out, in which the morphology or architecture of mind was emphasized as over against the *functional* attitude which emerged largely from biological concepts of mental adjustment to the environment. In this sense mind continually does something which is implied by the psychologist who describes the operation. On this basis Angell is a functional psychologist. Then we have the *dynamic* type of psychology emphasized chiefly by Woodworth in his notion of

the 'drive' which is more than a purpose in that it is couched also in energetic terms much like the dynamism of James; and finally we have the insistence on mind whose ultimate persistent unit is a *person* as is illustrated in our present time by the writings of Calkins but emphasized also by James and many others. In this sense, mind is always 'somebody being conscious.' The next division shows the influence of affiliated sciences on the concept of mind and therefore differentiates *psychobiology* from *psychophysiology*. In the former, psychology is considered one of the biological sciences in the sense that the mental life becomes a phase of life principles in general as in the writings of Seashore and Warren. This leads directly then to four theoretical psychosomatic points of view. In the physiological sense, psychology is described as being related to the body in any one of four different ways. The relationship may be *interactionistic*, *parallelistic*, *double aspective*, or *unitary*. Mind and body are said to interact when influences initiated in the mind produce effects in the body or when bodily disturbances produce mental changes. The causal relationship here is at once efficient and sufficient. In the parallelistic notion, mind and body proceed in a parallel manner so that changes in either one will be cotemporaneous and correlated with changes in the other, but neither one can be said to cause the other, unless cause is thought of merely as a relationship in time. In the double aspective theory, proposed originally by Spinoza, and best represented now by Warren, the concept applies to a single reality whose mental characteristics appear from only one of two points of view. This theory aims to be monistic. In the unitary concept the main emphasis is on a single ultimate entity which is either theoretically realistic or, on the other hand, wholly idealistic. From the materialistic or realistic angle mind can not only be explained in terms of physical phenomena, but is nothing more than a physical fact. Whereas, in the idealistic interpretation, the body is, in the words of Royce, 'of the stuff that dreams are made of.' In the last bracket which emphasizes the methodological approach we have juxtaposed the method of *introspection*, claiming to provide the underlying

symbols for all other methods but not necessarily denying the usefulness of those other methods; then *retrospection*, as the only possible, or perhaps the most usual, according to Angell, of the psychological methods; and finally the *behavioristic* method which in its most aggressive form denies the scientific values of introspection and consciousness in general. Many writers are adopting a revised terminology for introspection, preferring 'self-observation' and 'inspection,' but most psychologists still label even this type of psychology as introspective. It should also be said that in view of the fleeting character of mental processes retrospection means immediate observation of experiences just past.

The experimental division of the empirical bracket represents by far the largest group of activities in the science. Under the *pure* division we have experimental work done on *human* and *lower animal* forms, whereas in the *applied* division, sometimes called psychotechnics, the aim is to make psychological facts useful in many different directions, of which the eight categories listed are perhaps the most important. Alphabetically considered in the *aesthetic* division we find applications of psychological principles both by way of *impression*, i.e., of the more or less passive appreciation of art in any of its forms and by way of *expression* on the part of the composer or performer who produces artistic effects, thus expressing or interpreting his own feelings and ideas. It must not be denied of course that there is a pure psychology of *aesthetics* in which the principles of artistic appreciation and performance are in themselves investigated for no other purpose than in the sheer pursuit of knowledge. In the *civic* branch of applied psychology we have such problems as those of *eugenics*, or the 'science of being well-born' and *euthenics* or the science of good environment. Again, as in the former branch, there may be some principles of mental inheritance and training whose investigation might fall under pure psychology. In the *educational* division our efforts have been directed toward a more adequate *diagnosis* of school children's minds; toward a proper *prognostic* attitude, steering school children into suitable courses for their well-balanced mental

development; toward proper *administrative* procedure in the management of schools, and finally toward *pedagogical* improvement or the betterment of the teaching process and program. Under the *industrial* rubric we have problems of a *vocational* nature such as *vocational selection* or the choice of the right man for the job, and *vocational guidance*, or the choice of the right job for the man, and the *economic* program which considers the most efficient methods of *advertising*, *salesmanship* and office, factory, or *personnel* management. Under the *legal* caption applied psychology takes the direction of *reforming* criminals, of *detecting* guilt, and of validating *evidence* and testimony in court. A decade ago under the *martial* heading we faced not only the question of the *personnel* equipment of the army and navy in all of its branches, but also the *special problems* of memory in aviation, of testimony obtained by intelligence officers, and the localization of sounds of many different types through various channels and media. The *medical* program furthers a better approach to mental disease in *psychiatry* and *psychopathology* and a more scientific means for the cure of mental diseases and temporary ailments under the heading of *psychotherapeutics*. And lastly, under the *recreational* program in the relation of psychology to athletics and to play, the study of mind has been of use in connection with the *directing* and coaching of athletic *performances* and games, in the analysis of the most efficient manner of playing, and in the observational study of the spectators on the bleachers or in the gymnasium.

If we continue to follow the chart across we find, first, a division of *individual* psychology into *normal* and *abnormal*. On the normal side further distinction is made between *systematic*, *genetic*, and *differential* psychology. Systematic psychology aims to take a complete logical view of the *typical adult* mind usually with an historical perspective toward the study of accumulated scientific facts under each rubric or psychological classification. Genetic psychology purposes to show a gradual development of mind and most generally follows the growth of the human individual from infancy through *childhood*, *adolescence*, and *maturity*. It also

takes into account any decline that may occur in *senescence*. Sometimes genetic psychology covers also the growth of mind in the lower animals from the simplest to the most complex as well as the growth of mind from primitive peoples to the most cultured mind that civilization has produced. In differential psychology the emphasis is on *individual differences*. This has sometimes been called *psychography*. Instead of taking into account the average normal mind in any of its forms, we here try to detect and describe the differences in capacity and performance that may be found from individual to individual.

The *subnormal* division of abnormal psychology includes minds of *defective*, *feeble-minded*, and *perverted* individuals, a type of psychology that has led to noteworthy results in the handling, treating, and occasional curing of persons who do not readily fit into our social scheme. A second branch of abnormal psychology concerns the *supernormal* mind which is just now being intensively studied in connection with the analysis of *gifted* children, *talented* adults, and *genius* as a whole. Such studies have appeared from time to time, as for instance those concerned with the mental operations of mathematical prodigies and musically talented individuals. A third possible division of abnormal psychology is on the side of *pathological* phenomena such as we find in the *obsessed* individual, in the *neuræsthenic* and *hyperæsthetic* individual. This form of psychology has gone under the name of psychopathology and includes many other mental diseases such as dementia præcox, senile dementia, and paranoia. Somewhere between the two classifications of normal and abnormal psychology lies the study of *unusual mental states and functions*. Among these we may consider such phenomena as *dreams*, *hallucinations*, *illusions*, *hypnosis*, and possibly the psychological explanations of *telepathy* and *telekinesis*.

Continuing the division of *pure experimental* psychology along the lines of *collective human* mind, we may make a useful distinction between *social* psychology and *ethnic*, or somewhat erroneously called 'folk' psychology. Social psychology concerns itself with the operations of the human and perhaps the lower animal mind when it is influenced by the *conscious*

presence of other minds. It is not necessary, of course, that these other individuals be physically present. One may be socially minded by seeing one's name in print in such a way that other people will notice it. But the social mind has been more generally studied in the formation of *crowds, mobs, assemblages* and *congregates*. The social mind may also be studied from the side of its *genetic* development, from the point of view of the increasing development of the social group of which it is a part. In such a sense we can speak of the 'mind' of the *family*, of the *tribe*, of the *state*, of the *nation*, and of the *commonwealth of nations*. Somewhere between these two divisions of the social mind and the genetic development of mind lies the study of the *mental precipitates of the group* such as social *products* consisting of *laws, customs, languages* and *arts* on the one hand, and the *institutional* creations of society on the other hand, such as *religion, education, the state, the league of nations*. Ethnic psychology in its *ethnological* section treats of the psychology of peoples considered from the point of view of *tribal* groups or from the side of national types. In this study the traditional effects of organized groups together with the environmental influences of weather, clothing, topography, and isolation are studied. On still a larger scale, the *anthropological* division takes account of the mind of different races, as, for instance, the Aryan, Mongolian, or the Semitic race. Mind from this aspect may be studied either as a *characteristic* mind or mind in the process of *evolution*, just as on the tribal side one might be inclined to differentiate tribes one from the other or to use them in a comparative study.

This finishes the condensed description of the important human branch of psychology, and we have still to speak briefly of the pure experimental researches on the lower animals. The attitude here may be either one of *description* of mind of characteristic species, such as the mind of the dog, the mind of the ape, or going much lower down, the mind of the paramecium. By showing the limitations of these lower forms, we grow to realize more and more the complexity of the normal human individual mind. But we may also

investigate the lower animal mind from a sort of comparative point of view leading eventually to a genetic development of mind from one step of its *evolution* to another, thus obtaining what might be called a moving picture of mind from the lower animals on up to the highest animal mind in man.

This logical classification is, of course, tentative and subject to the revision of knowledge as we obtain it decade after decade. It is also open to individual variation depending upon the theoretical points of view which one takes in psychology. But as a working program it is useful in drawing attention at once to the divergent aspect of experimental research and theoretical study which comes with scientific development and progress, and also to the logical connection of one branch with every other branch of the science. To some extent, no doubt, the logical separations in many places seem artificial but that shortcoming is unavoidable in any classification.

In the writer's experience the schema has served best as a mechanical aid to psychological orientation—as a means of 'charting the high seas' of psychology. It has been built up bit by bit as the years of teaching experience have shown the necessity for addenda and corrigenda. Graduate students as well as undergraduate students have openly commented favorably on the schema, especially as a pedagogical instrument for the visually minded learner. In publishing it the writer hopes to be benefitted by further criticism of both negative and positive kinds.

DISCUSSION

A BEHAVIORISTIC INTERPRETATION OF JAZZ

Musicians seem much concerned over the matter of jazz. There have been many recent magazine articles, condemning or applauding it. Some say that it is a regression to a more primitive type of music; others maintain that it represents a very highly developed technique. What is the psychology of that engaging rhythm? Why has the misplaced accent of syncopation fascinated the world and set it dancing as it has never danced before?

There is very often a tendency to dismiss jazz music as too crude and too popular. Musical critics usually refer to it with disdain, and condemn the efforts of a Gershwin to raise it to the level of symphonic music. The psychologist thinks deeper than this; he is concerned with jazz as a social phenomenon. The way people react to different types of music is a part of social psychology, and a dignified topic worth the attention of any scientist.

Æsthetes may contend that jazz is a 'low' form of music, and that Debussy, Strauss or Stravinski represent a relatively 'high' form. The psychologist's interest does not coincide with musical canons. He is studying human reactions. The reaction to jazz is just as strong in some people as the reaction to a symphony is in others. The critic gets his *frisson esthétique* from the Kreutzer Sonata; the flapper gets her *thrill* from Irving Berlin's latest number. If these reactions are equally strong, they are of equal psychological interest. The relative musical evaluations of them by learned critics does not interest us so much as the human response to them. Our material is this *frisson esthétique* on one hand and this *thrill* on the other.

In considering jazz, then, not from the standpoint of the critic's imponderable standards but from the psychological standpoint of people's reactions to it, we are led into an evaluation of jazz in terms of *behavior*. For it is an easily observable fact that the behavior of people listening to classical music is markedly different from the behavior of those listening to jazz. This difference of reactions it is up to the psychologist to explain.

Consider some typical audiences. When a person goes to a

concert, his reaction is entirely an inner one. He sits in a narrow seat motionless for a three-hour program. It is bad form if he shows any facial emotion, is restless in his place, or talks to his neighbor. When a selection is over, a few superficial comments are made; to discuss a piece of music at all extensively requires much technical knowledge. The usual auditor simply remarks that he did like it or didn't like it, and can say little more. The Ninth Symphony may furnish him an intense emotional experience, but little of it is visible to an onlooker, nothing much can be said of it save a few words of praise, and it probably has little influence on his subsequent acts. In brief, the reaction to a classical concert is entirely an *implicit* reaction.

The jazz audience is to be found both at the dance and in the theater. In both cases the reaction is very different from that of the silent seated listeners at a concert or recital. At the dance hall the music makes the listeners react with movements of their bodies. Jazz is the greatest of all dance music, due to the steadiness of its fundamental rhythm and the appealing quality of its syncopation. The dance is, of course, a strong body reaction, involving not only rhythmic movements of the feet but often the torso, shoulders and arms as well. This *explicit* body reaction is not confined to the dancers; practically everyone within hearing distance of the music keeps time with it in some way. The body movements of the members of the orchestra are very evident, egregiously so in the case of the leader. So we see that at the dance hall jazz induces in practically every hearer an overt reaction, consisting of rhythmical body movements.

The other domain of jazz is in the theater. Here also easily observable reactions occur. They are, usually, beating time to the music with fingers or feet. It is also not unusual (in young people) to observe rhythmic snapping of the fingers or sinuous body movements. If many people in the audience are familiar with the words of the music being played, one can readily notice them humming or softly singing in accompaniment. Sometimes the performers take this into account, and request the whole audience to sing with them. Generally speaking, the reaction to jazz music is to a large degree an explicit reaction.¹

¹ All so-called *popular* music brings forth an overt reaction of some sort, in that it is usually accompanied by tapping, humming, etc. 'Home Sweet Home' does this as well as 'Alabama Bound.' Jazz is merely the best and most distinctive of popular music.

From his viewpoint of behavior reactions, the psychologist must conclude that jazz differs from classical music principally because it induces a different reaction in the listener. The response to one is an implicit response. The response to the other is explicit. This is the main thing which distinguishes the two.

No adequate musical differentiation of these distinct types of music can be made; there is only a psychological differentiation. There is nothing in jazz music whose origin cannot be found in classical music. Syncopation was in use long before jazz was ever known. The saxophone was invented as far back as 1840, and has been used in military bands ever since. The steady fundamental rhythm of jazz is to be found in all march tempo. The popular sentiment embodied in the words to a jazz 'hit' is not by any means new. Musically, there is not a very great difference between classicism and jazz; the latter is only a very exaggerated type. The chief distinction between them is the matter of human reactions to both.

This interpretation answers some of the many questions about jazz which have long been debated. Isn't jazz a 'low' type of music? Not necessarily. It is a *different* type, rather than an *inferior* type. It has a different purpose, and achieves different ends. In its own field, jazz is fully as 'high' and fully as dignified as classic music is in its. A person can get fully as much pleasure and fully as great an emotional reaction from a jazz selection as he can get from 'Also Sprach Zarathustra,' if only his musical education has trained him to appreciate both. Another question, can the jazz form of music ever be used in symphonic compositions? Probably not. Symphonic music aims at an implicit type of response for which jazz is illy fitted. The dance hall rather than the concert hall is the place for jazz.

J. B. EGGEN

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